FIG.1

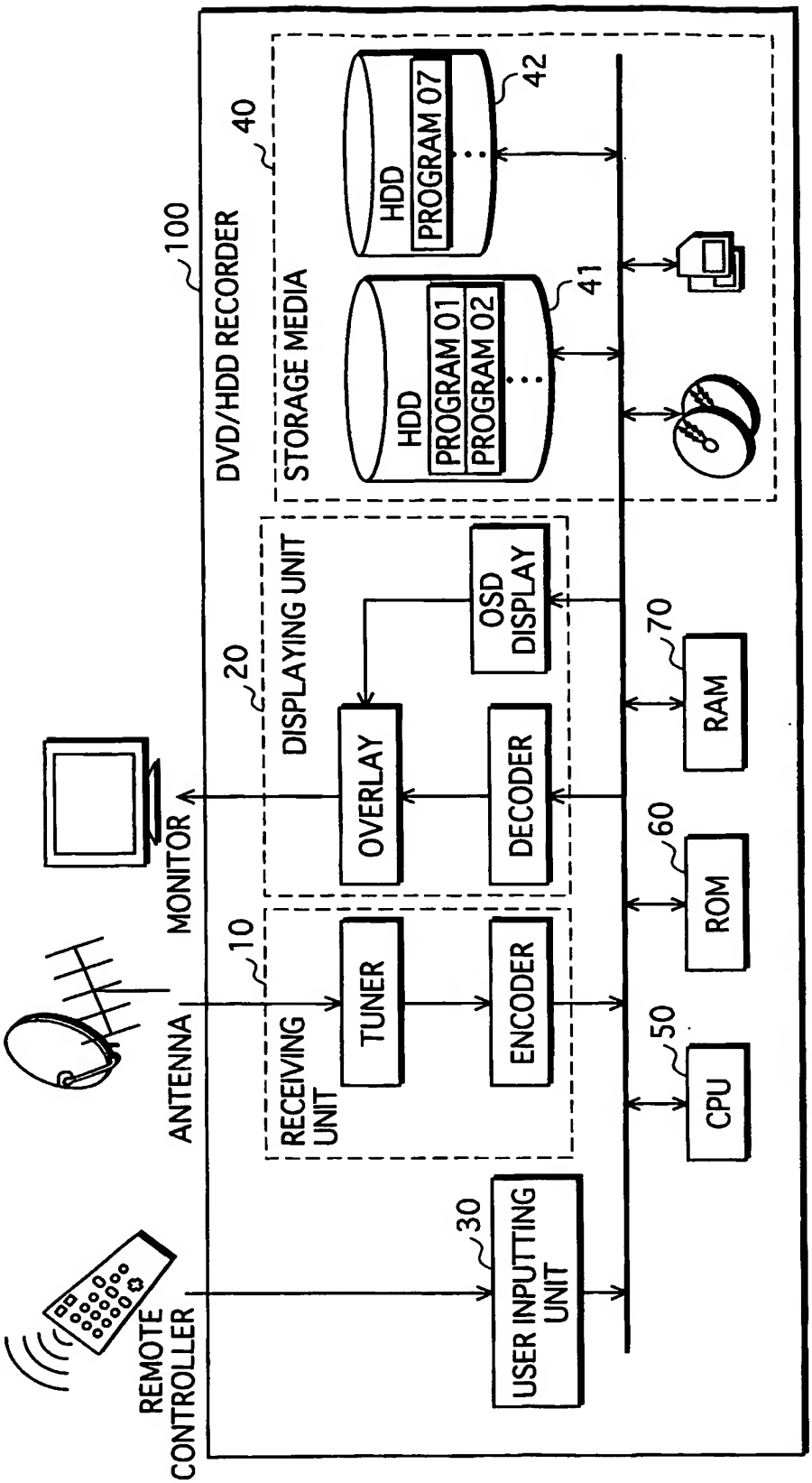

100
DVD/HDD RECORDER
40
STORAGE MEDIA
HDD
PROGRAM 07
42
HDD
PROGRAM 01
PROGRAM 02
41
20
DISPLAYING UNIT
OSD DISPLAY
OVERLAY
DECODER
70
RAM
60
ROM
MONITOR
10
RECEIVING UNIT
TUNER
ENCODER
50
CPU
ANTENNA
30
USER INPUTTING UNIT
REMOTE CONTROLLER

FIG.2

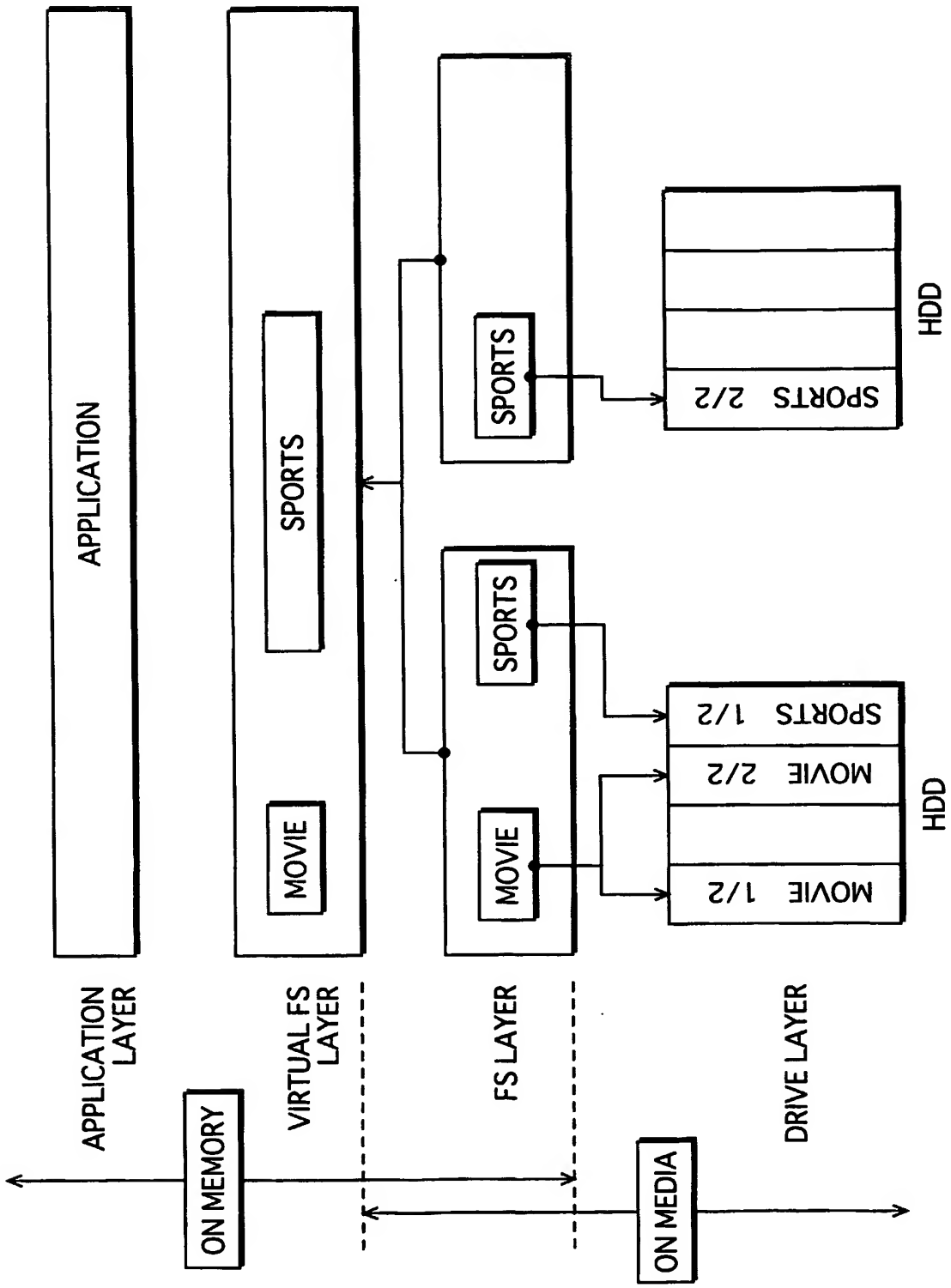

APPLICATION
SPORTS
MOVIE
SPORTS
MOVIE
SPORTS 2/2
HDD
SPORTS 1/2
MOVIE 2/2
MOVIE 1/2
HDD
APPLICATION LAYER
VIRTUAL FS LAYER
FS LAYER
DRIVE LAYER
ON MEMORY
ON MEDIA

FIG.3

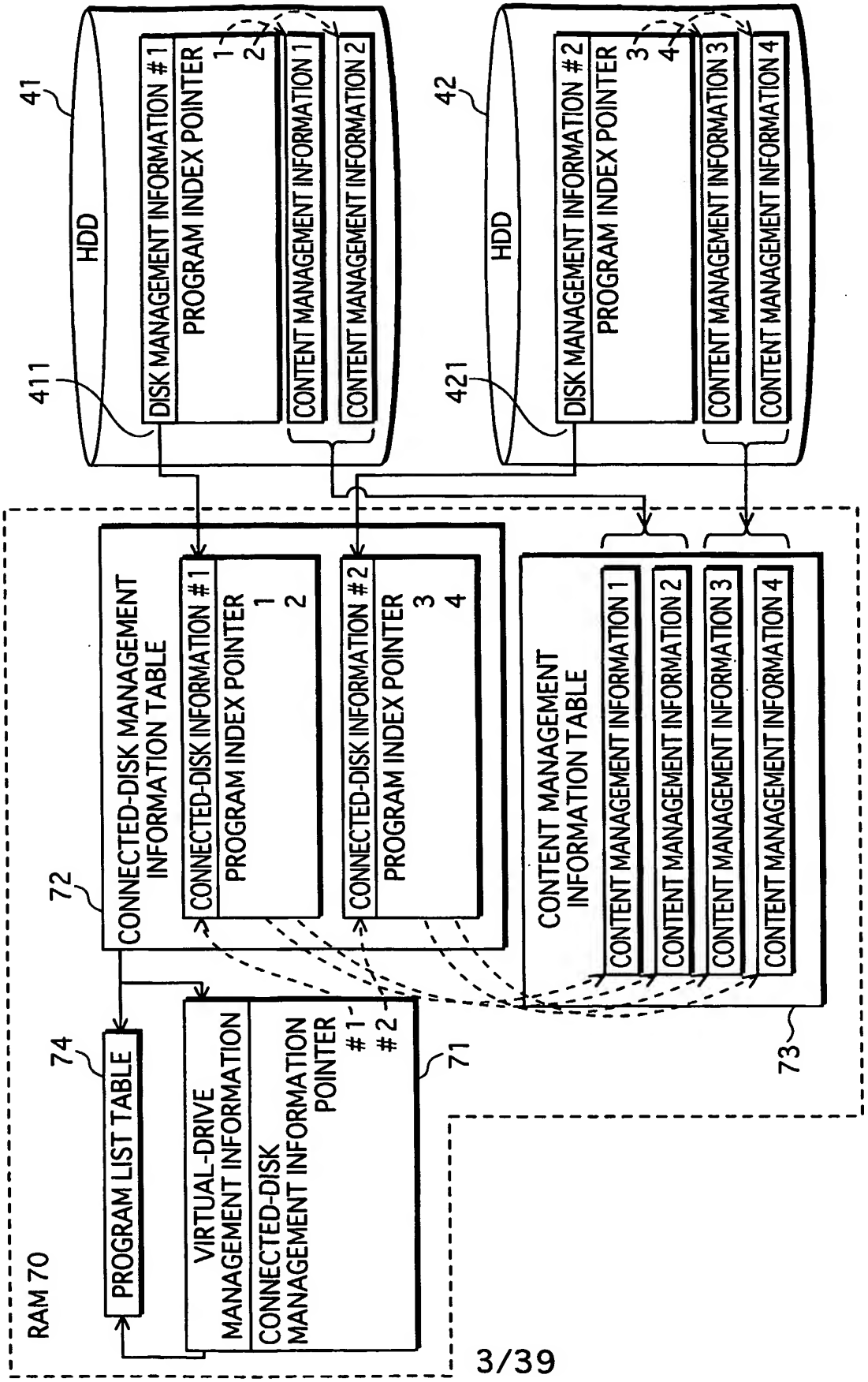

41
HDD
411
DISK MANAGEMENT INFORMATION #1
PROGRAM INDEX POINTER
1
2
CONTENT MANAGEMENT INFORMATION 1
CONTENT MANAGEMENT INFORMATION 2
42
HDD
421
DISK MANAGEMENT INFORMATION #2
PROGRAM INDEX POINTER
3
4
CONTENT MANAGEMENT INFORMATION 3
CONTENT MANAGEMENT INFORMATION 4
RAM 70
72
CONNECTED-DISK MANAGEMENT INFORMATION TABLE
CONNECTED-DISK INFORMATION #1
PROGRAM INDEX POINTER
1
2
CONNECTED-DISK INFORMATION #2
PROGRAM INDEX POINTER
3
4
CONTENT MANAGEMENT INFORMATION TABLE
CONTENT MANAGEMENT INFORMATION 1
CONTENT MANAGEMENT INFORMATION 2
CONTENT MANAGEMENT INFORMATION 3
CONTENT MANAGEMENT INFORMATION 4
73
74
PROGRAM LIST TABLE
VIRTUAL-DRIVE MANAGEMENT INFORMATION
CONNECTED-DISK MANAGEMENT INFORMATION POINTER
#1
#2
71

FIG.4

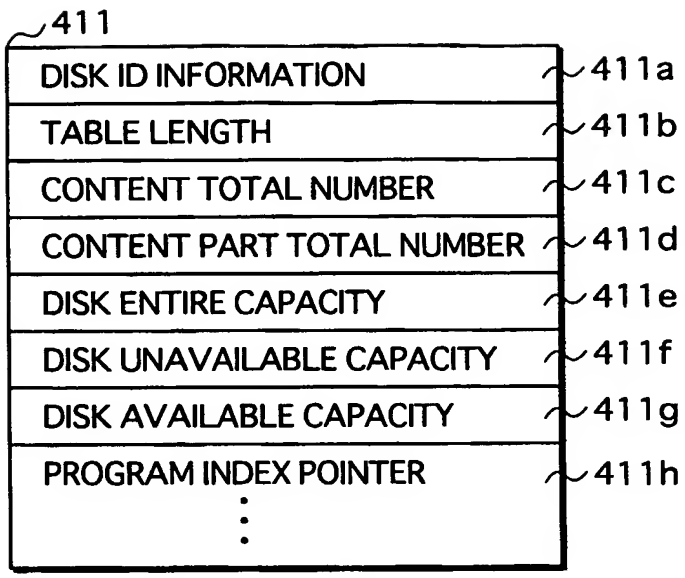



FIG.5

| CONTENT ID INFORMATION |
|---|
| TABLE LENGTH |
| DIVIDE FLAG |
| REMOVE FLAG |
| TOTAL DIVISION NUMBER |
| SEQUENCE NUMBER |
| RECORDING START POSITION |
| RECORDING LENGTH |
| MANAGEMENT-PURPOSE INFORMATION |

FIG.6

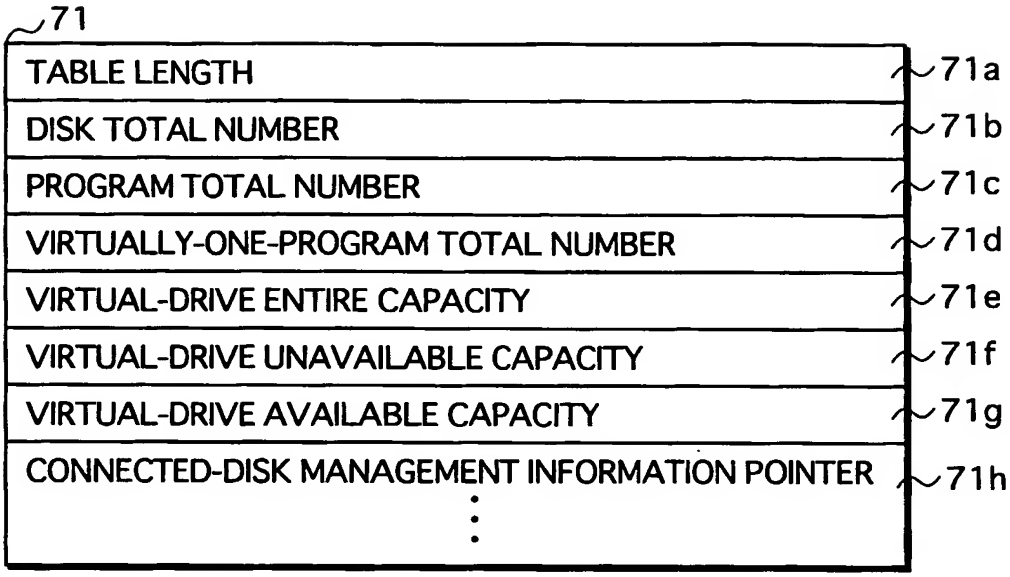

71
TABLE LENGTH
71a
DISK TOTAL NUMBER
71b
PROGRAM TOTAL NUMBER
71c
VIRTUALLY-ONE-PROGRAM TOTAL NUMBER
71d
VIRTUAL-DRIVE ENTIRE CAPACITY
71e
VIRTUAL-DRIVE UNAVAILABLE CAPACITY
71f
VIRTUAL-DRIVE AVAILABLE CAPACITY
71g
CONNECTED-DISK MANAGEMENT INFORMATION POINTER
71h

FIG.7

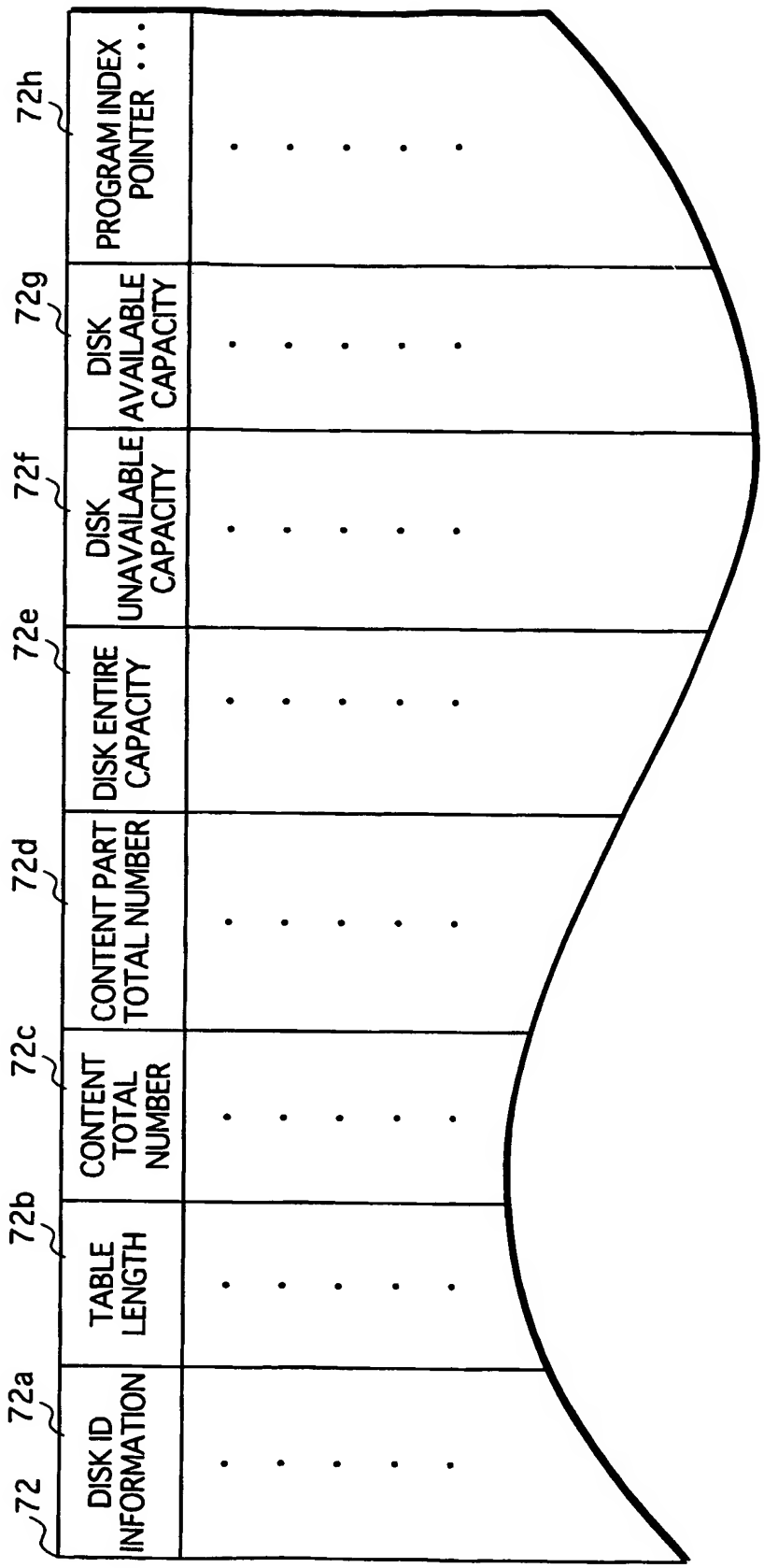

72
DISK ID INFORMATION
72a
TABLE LENGTH
72b
CONTENT TOTAL NUMBER
72c
CONTENT PART TOTAL NUMBER
72d
DISK ENTIRE CAPACITY
72e
DISK UNAVAILABLE CAPACITY
72f
DISK AVAILABLE CAPACITY
72g
PROGRAM INDEX POINTER ・・・
72h

FIG.8

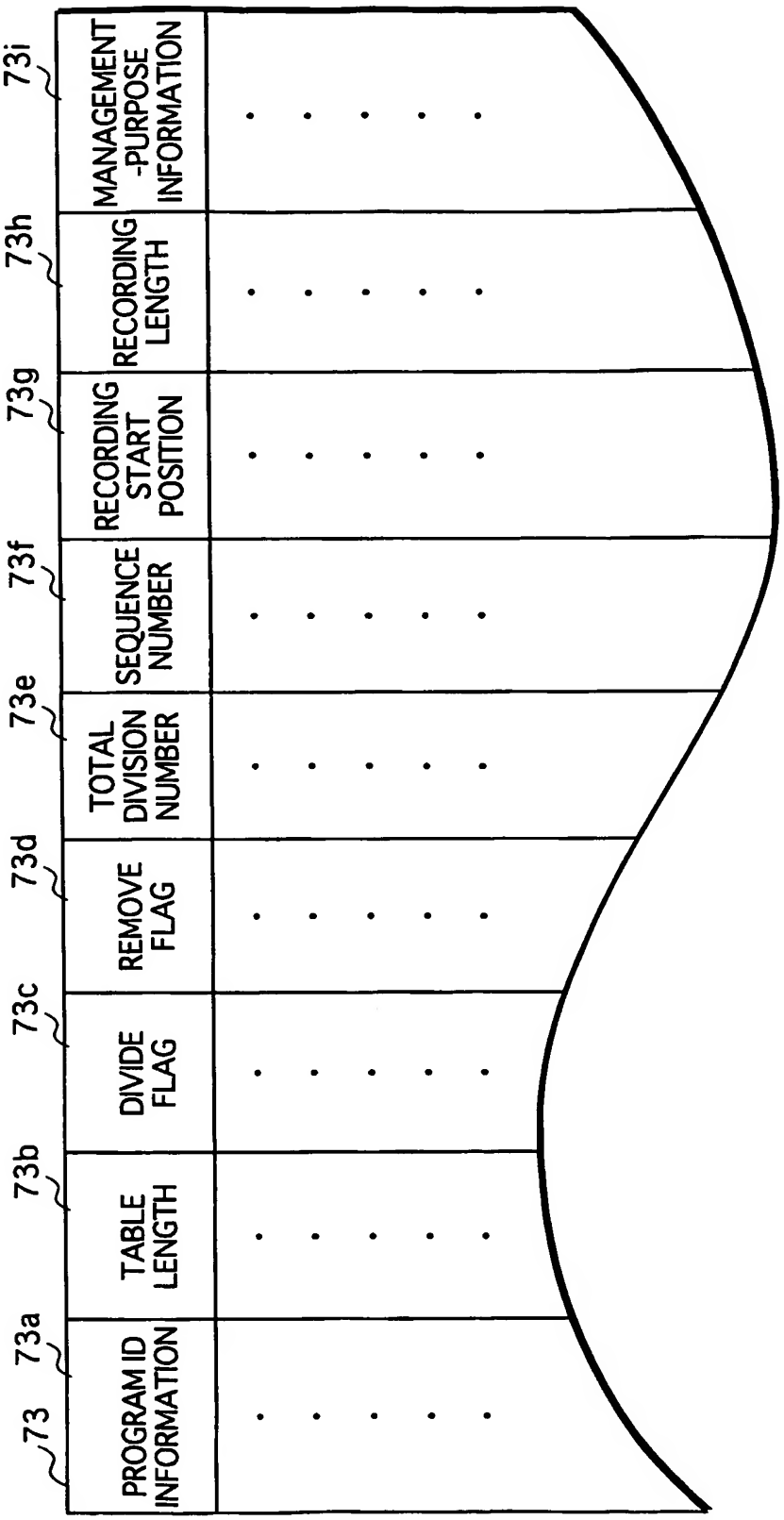
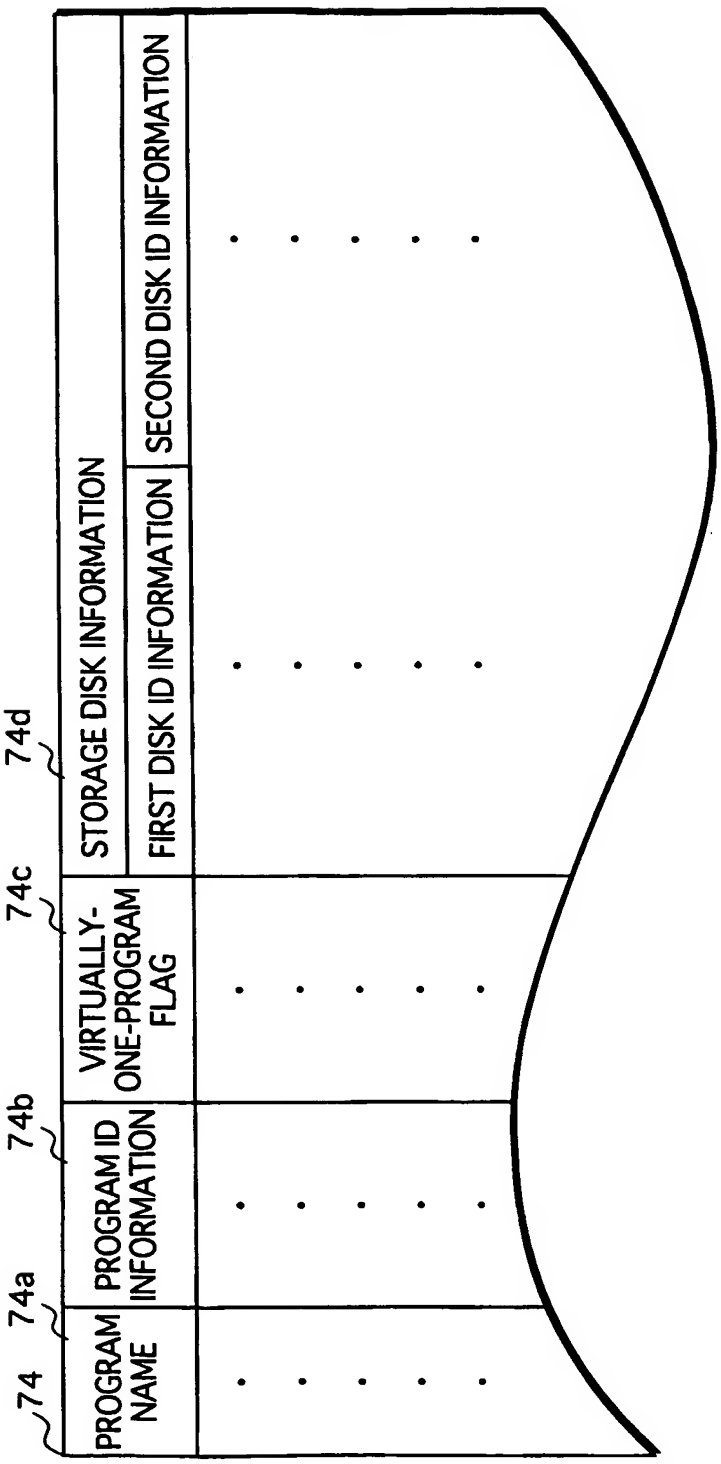

73
PROGRAM ID INFORMATION
73a
TABLE LENGTH
73b
DIVIDE FLAG
73c
REMOVE FLAG
73d
TOTAL DIVISION NUMBER
73e
SEQUENCE NUMBER
73f
RECORDING START POSITION
73g
RECORDING LENGTH
73h
MANAGEMENT -PURPOSE INFORMATION
73i

FIG.9


74
PROGRAM NAME
74a
PROGRAM ID INFORMATION
74b
VIRTUALLY-ONE-PROGRAM FLAG
74c
STORAGE DISK INFORMATION
74d
FIRST DISK ID INFORMATION
SECOND DISK ID INFORMATION

10/538552

FIG.10

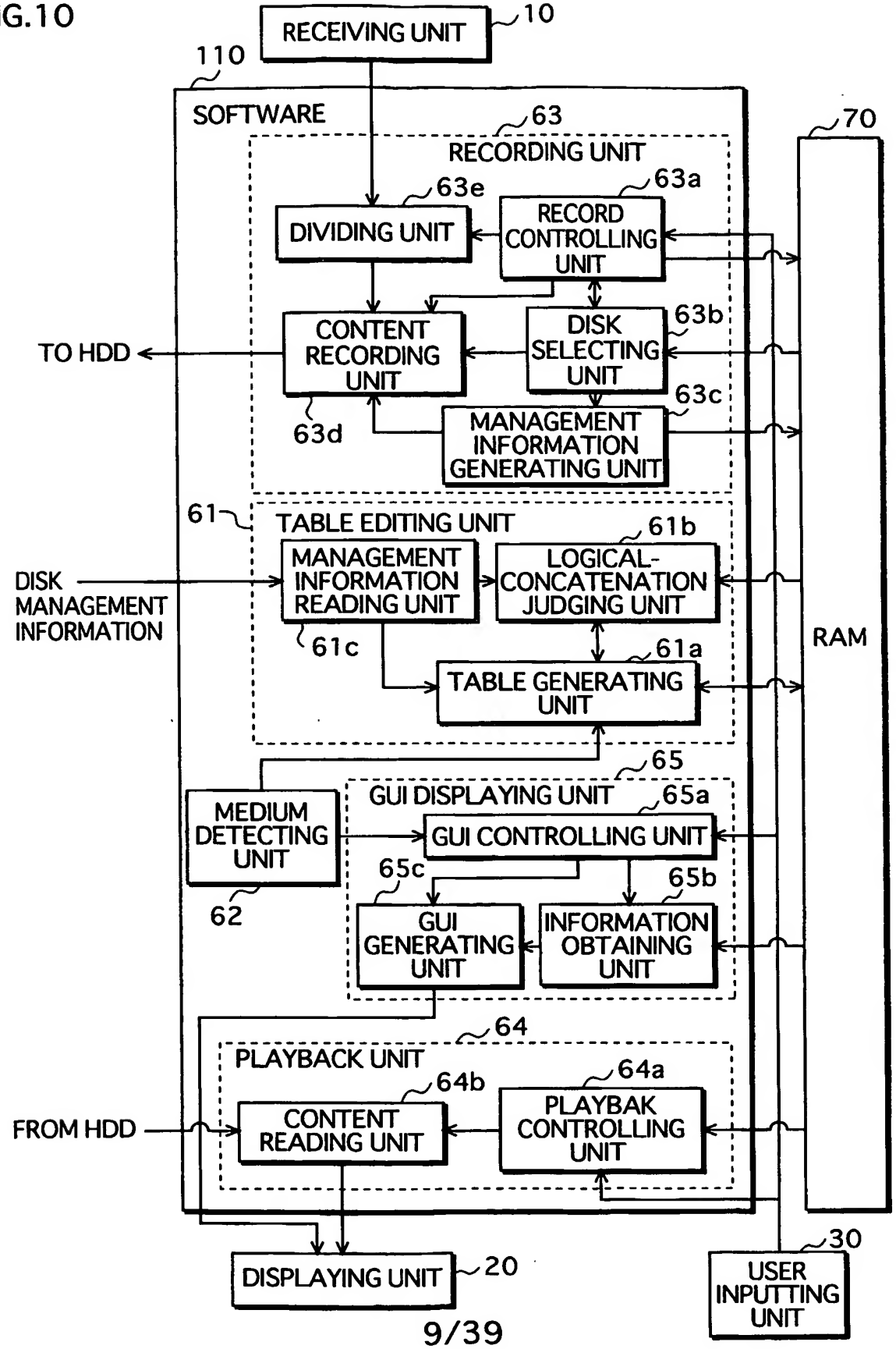


FIG.11

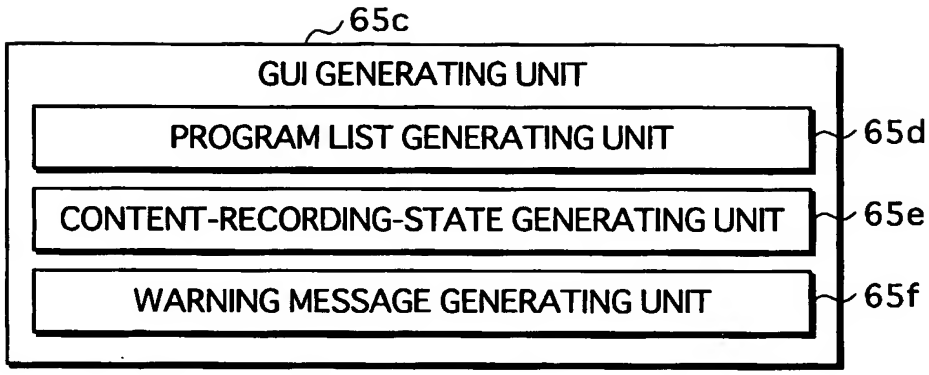

65c
GUI GENERATING UNIT
PROGRAM LIST GENERATING UNIT
65d
CONTENT-RECORDING-STATE GENERATING UNIT
65e
WARNING MESSAGE GENERATING UNIT
65f

FIG.12

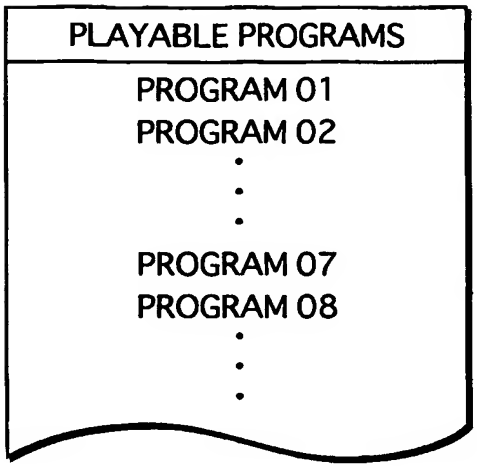

PLAYABLE PROGRAMS
PROGRAM 01
PROGRAM 02
PROGRAM 07
PROGRAM 08

FIG.13

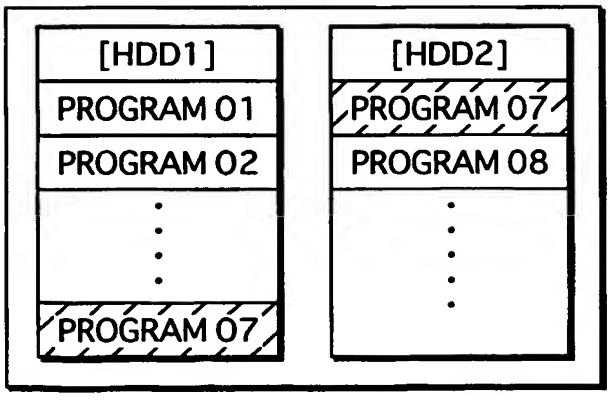

[HDD1]
PROGRAM 01
PROGRAM 02
PROGRAM 07
[HDD2]
PROGRAM 07
PROGRAM 08

FIG.14

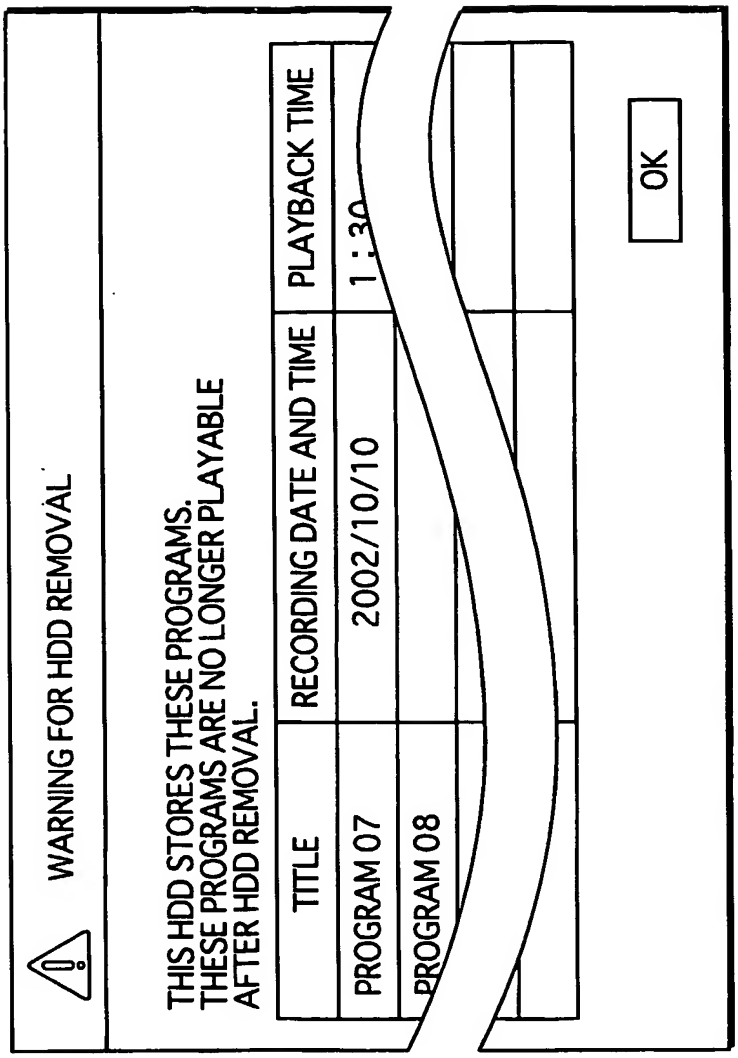

WARNING FOR HDD REMOVAL
THIS HDD STORES THESE PROGRAMS.
THESE PROGRAMS ARE NO LONGER PLAYABLE
AFTER HDD REMOVAL.
TITLE
RECORDING DATE AND TIME
PLAYBACK TIME
PROGRAM 07
2002/10/10
1:30
PROGRAM 08
OK

FIG.15

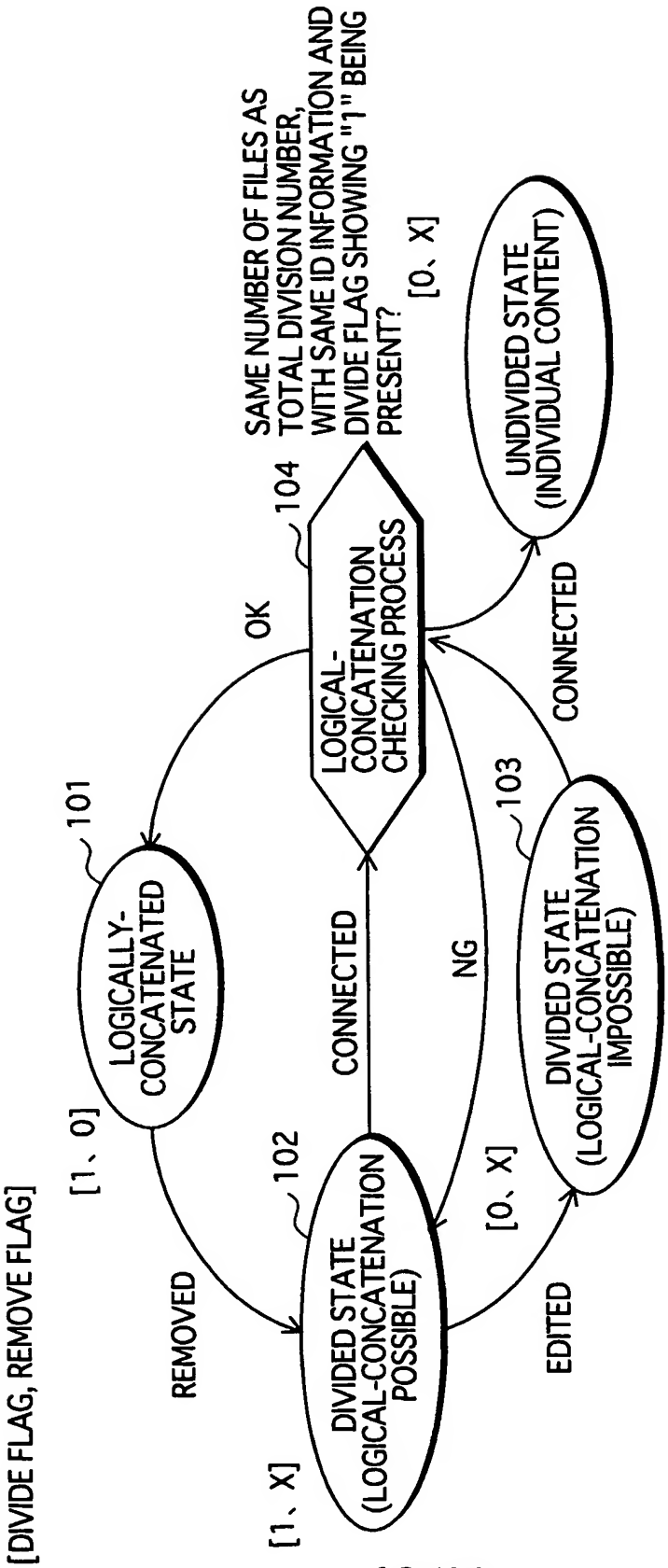
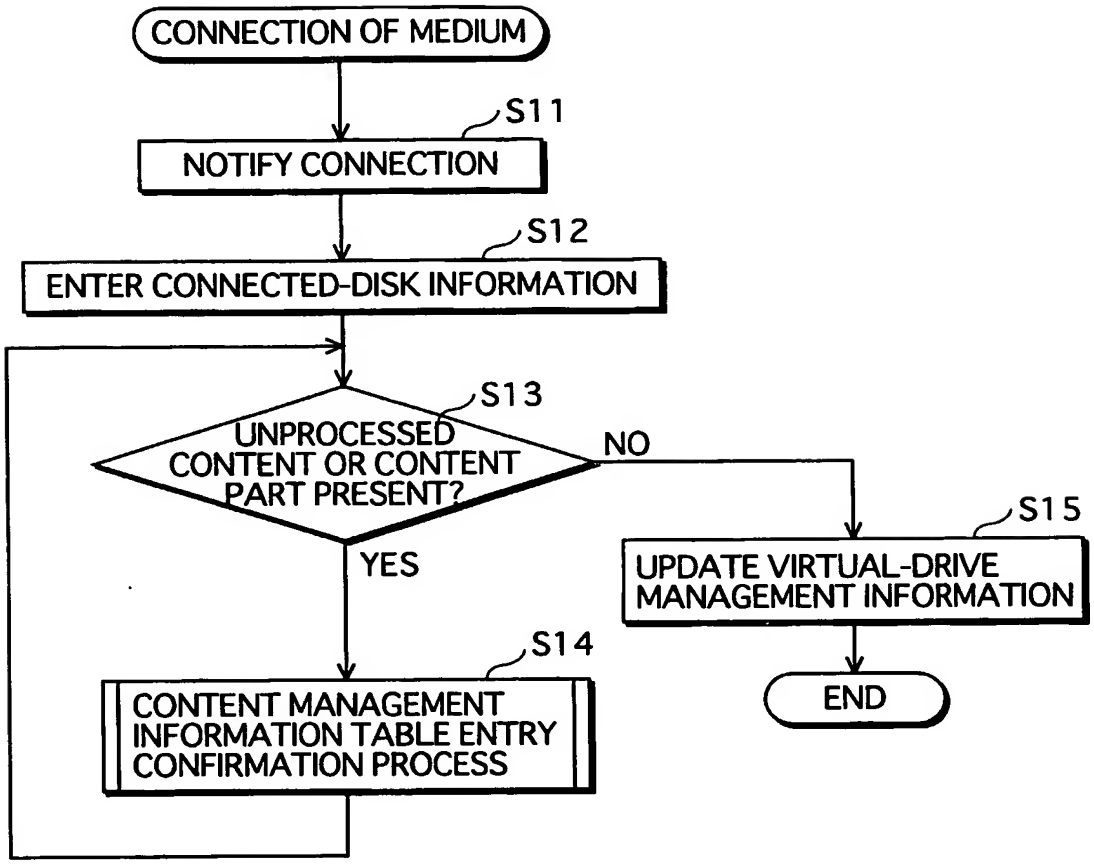

[DIVIDE FLAG, REMOVE FLAG]
LOGICALLY-CONCATENATED STATE
101
[1、0]
REMOVED
DIVIDED STATE (LOGICAL-CONCATENATION POSSIBLE)
102
[1、X]
CONNECTED
LOGICAL-CONCATENATION CHECKING PROCESS
104
SAME NUMBER OF FILES AS TOTAL DIVISION NUMBER, WITH SAME ID INFORMATION AND DIVIDE FLAG SHOWING "1" BEING PRESENT?
OK
NG
DIVIDED STATE (LOGICAL-CONCATENATION IMPOSSIBLE)
103
[0、X]
EDITED
CONNECTED
UNDIVIDED STATE (INDIVIDUAL CONTENT)
[0、X]

FIG.16


CONNECTION OF MEDIUM
S11
NOTIFY CONNECTION
S12
ENTER CONNECTED-DISK INFORMATION
S13
UNPROCESSED CONTENT OR CONTENT PART PRESENT?
NO
YES
S15
UPDATE VIRTUAL-DRIVE MANAGEMENT INFORMATION
END
S14
CONTENT MANAGEMENT INFORMATION TABLE ENTRY CONFIRMATION PROCESS

10/539552

FIG.17

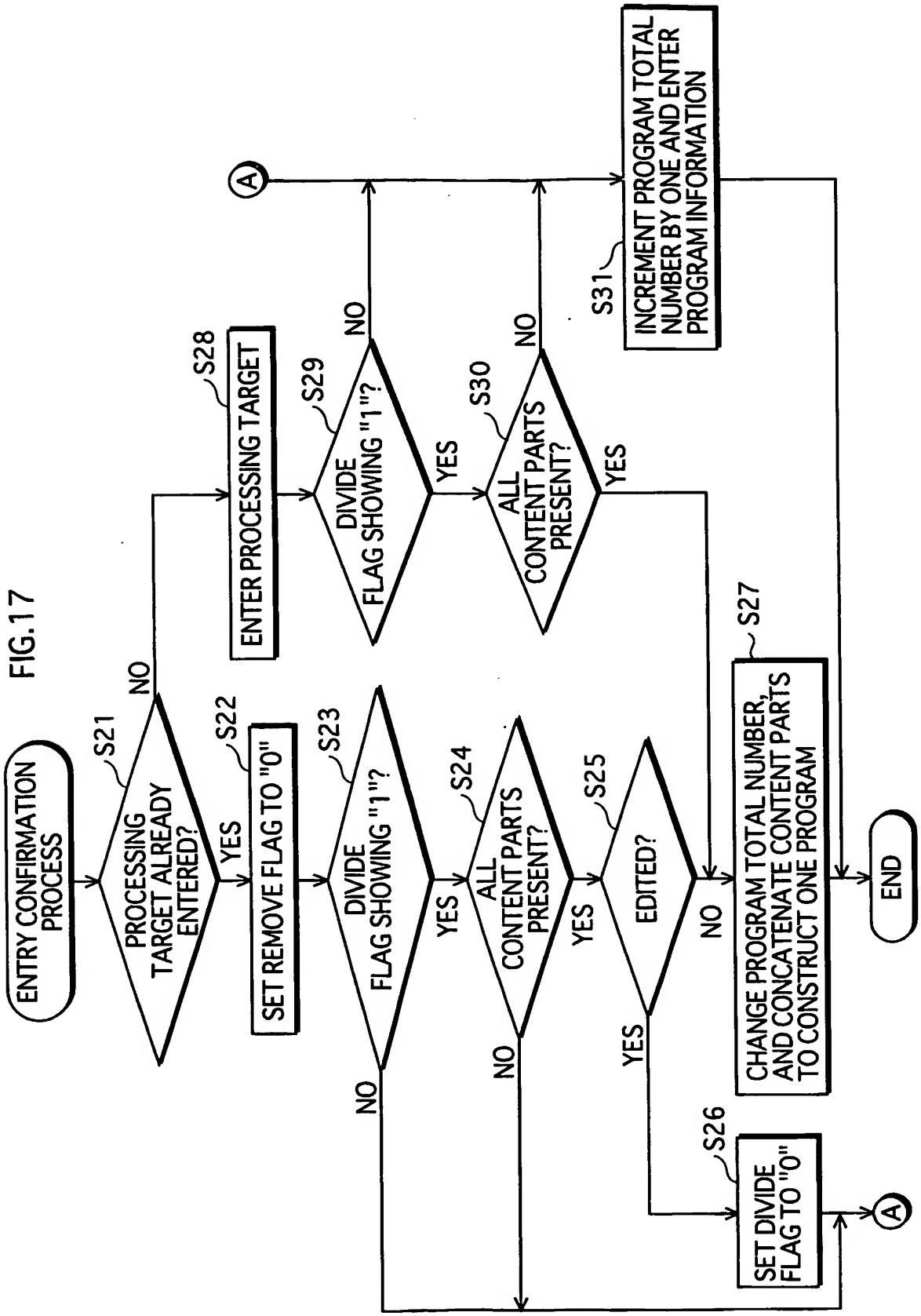


FIG.18

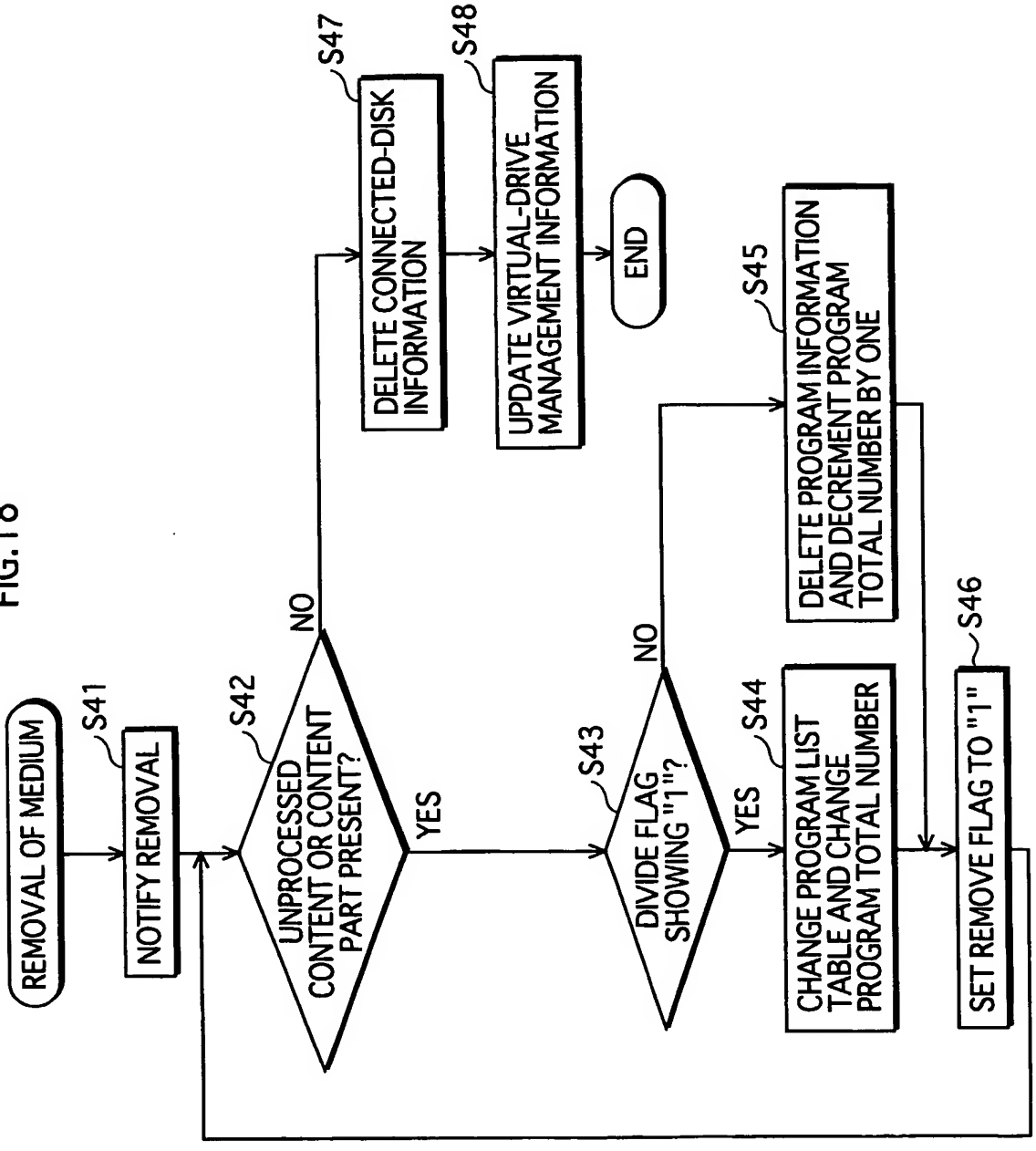

REMOVAL OF MEDIUM
S41
NOTIFY REMOVAL
S42
UNPROCESSED CONTENT OR CONTENT PART PRESENT?
NO
YES
S47
DELETE CONNECTED-DISK INFORMATION
S48
UPDATE VIRTUAL-DRIVE MANAGEMENT INFORMATION
END
S43
DIVIDE FLAG SHOWING "1"?
NO
YES
S44
CHANGE PROGRAM LIST TABLE AND CHANGE PROGRAM TOTAL NUMBER
S45
DELETE PROGRAM INFORMATION AND DECREMENT PROGRAM TOTAL NUMBER BY ONE
S46
SET REMOVE FLAG TO "1"

FIG.19

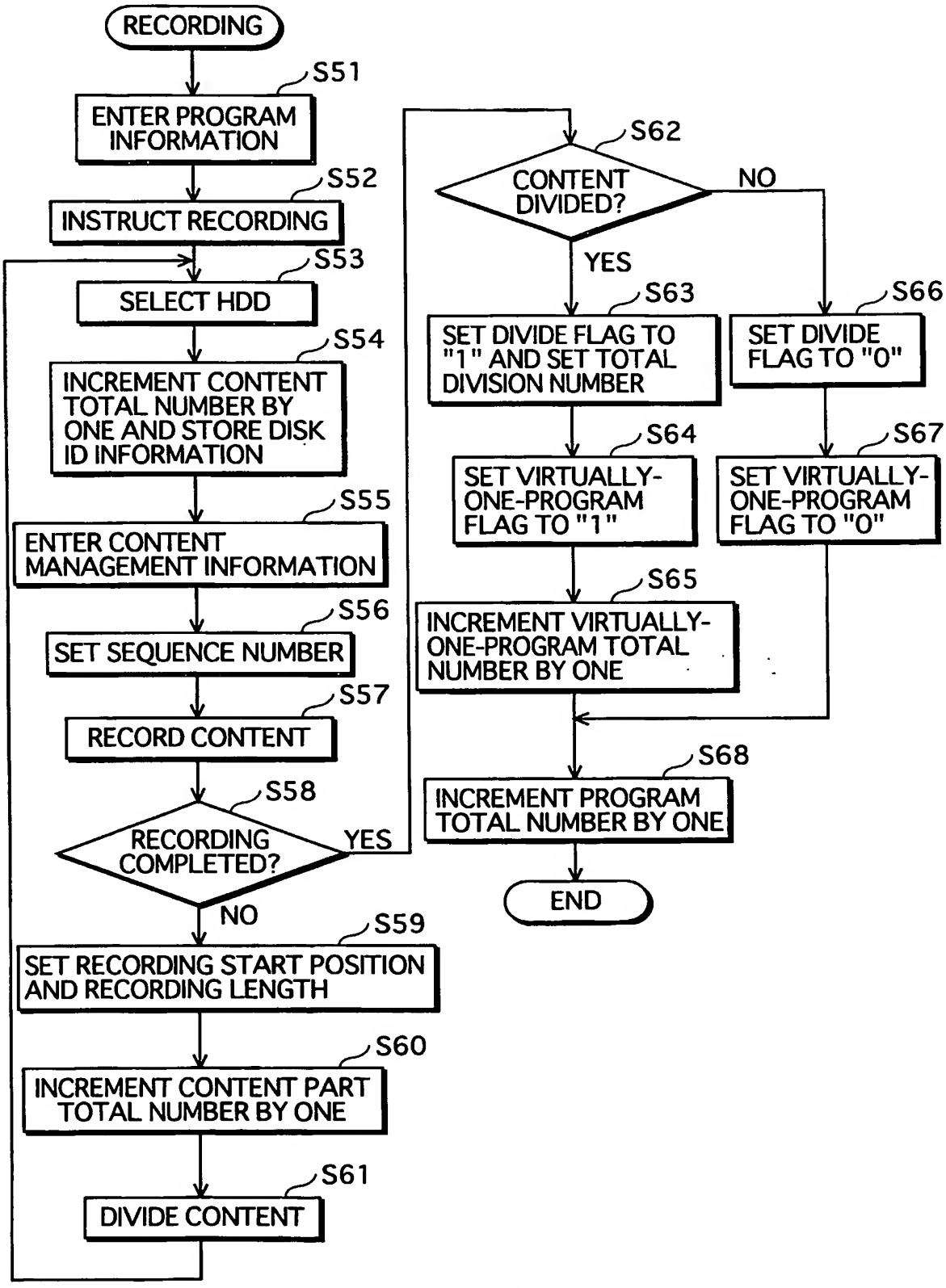

RECORDING
S51
ENTER PROGRAM INFORMATION
S52
INSTRUCT RECORDING
S53
SELECT HDD
S54
INCREMENT CONTENT TOTAL NUMBER BY ONE AND STORE DISK ID INFORMATION
S55
ENTER CONTENT MANAGEMENT INFORMATION
S56
SET SEQUENCE NUMBER
S57
RECORD CONTENT
S58
RECORDING COMPLETED?
YES
NO
S59
SET RECORDING START POSITION AND RECORDING LENGTH
S60
INCREMENT CONTENT PART TOTAL NUMBER BY ONE
S61
DIVIDE CONTENT
S62
CONTENT DIVIDED?
NO
YES
S63
SET DIVIDE FLAG TO "1" AND SET TOTAL DIVISION NUMBER
S64
SET VIRTUALLY-ONE-PROGRAM FLAG TO "1"
S65
INCREMENT VIRTUALLY-ONE-PROGRAM TOTAL NUMBER BY ONE
S66
SET DIVIDE FLAG TO "0"
S67
SET VIRTUALLY-ONE-PROGRAM FLAG TO "0"
S68
INCREMENT PROGRAM TOTAL NUMBER BY ONE
END

FIG.20

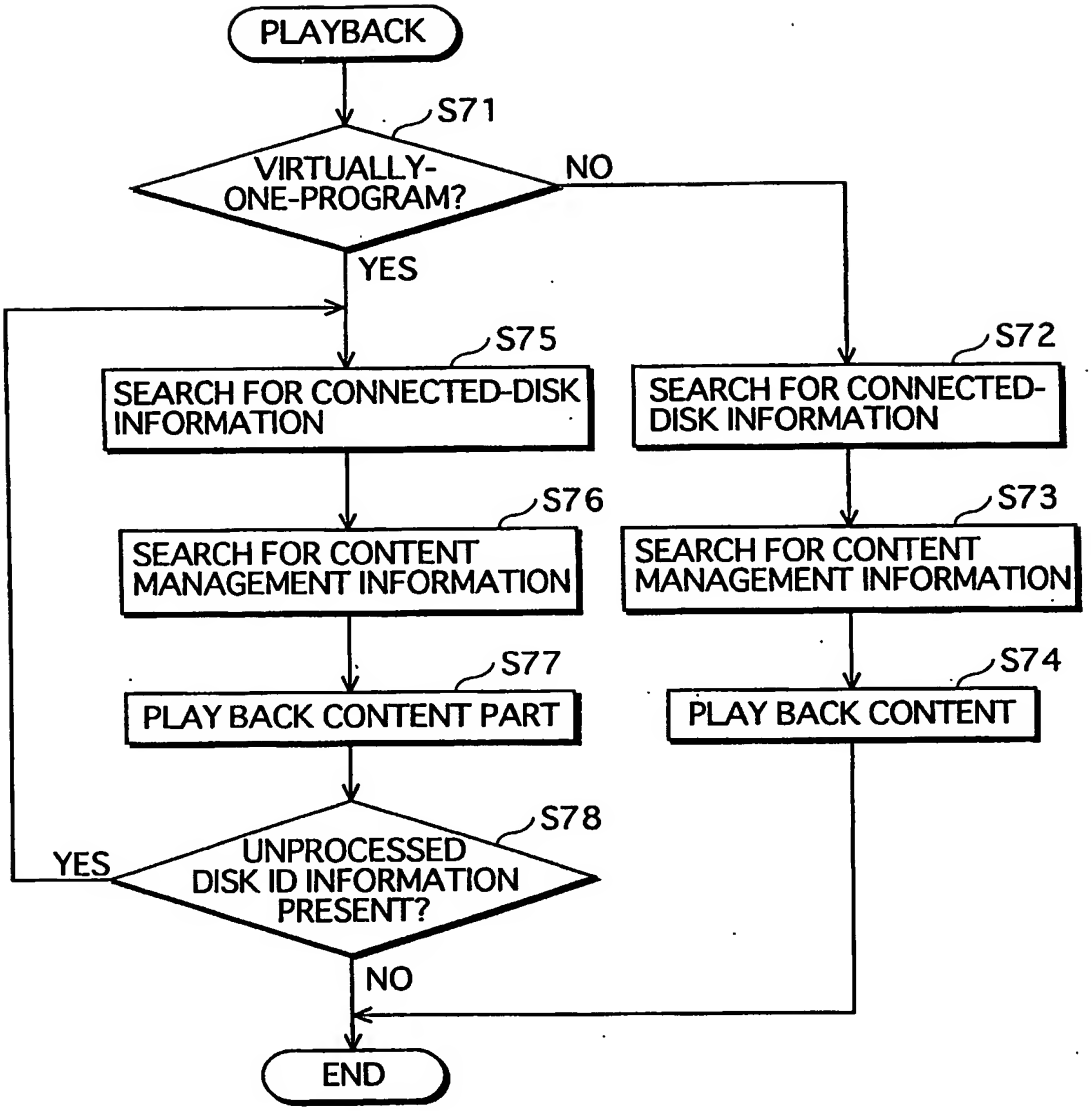

PLAYBACK
S71
VIRTUALLY-ONE-PROGRAM?
NO
YES
S75
SEARCH FOR CONNECTED-DISK INFORMATION
S72
SEARCH FOR CONNECTED-DISK INFORMATION
S76
SEARCH FOR CONTENT MANAGEMENT INFORMATION
S73
SEARCH FOR CONTENT MANAGEMENT INFORMATION
S77
PLAY BACK CONTENT PART
S74
PLAY BACK CONTENT
S78
YES
UNPROCESSED DISK ID INFORMATION PRESENT?
NO
END

FIG.21

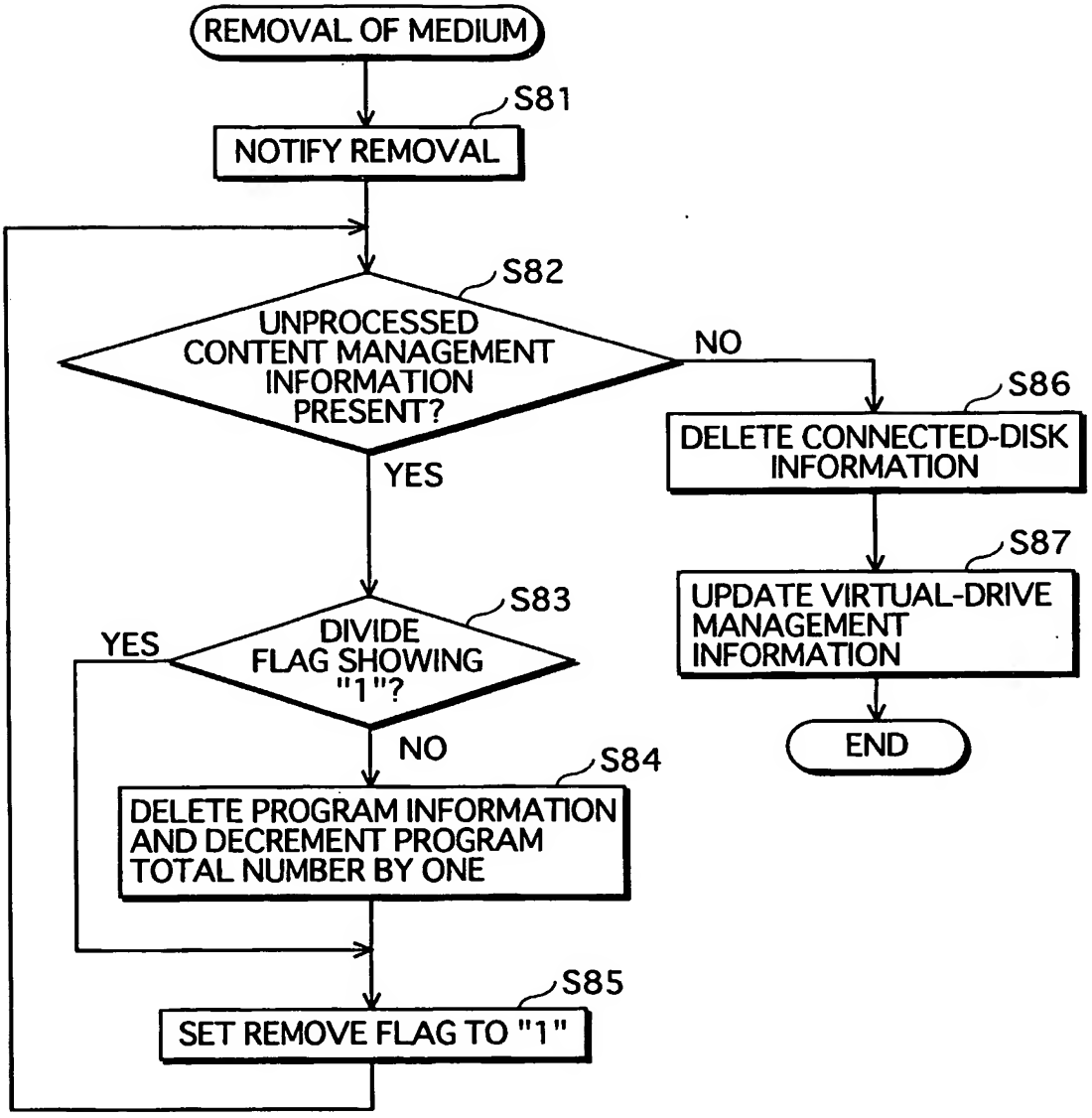

REMOVAL OF MEDIUM
S81
NOTIFY REMOVAL
S82
UNPROCESSED CONTENT MANAGEMENT INFORMATION PRESENT?
NO
YES
S86
DELETE CONNECTED-DISK INFORMATION
S87
UPDATE VIRTUAL-DRIVE MANAGEMENT INFORMATION
END
S83
DIVIDE FLAG SHOWING "1"?
YES
NO
S84
DELETE PROGRAM INFORMATION AND DECREMENT PROGRAM TOTAL NUMBER BY ONE
S85
SET REMOVE FLAG TO "1"

FIG.22

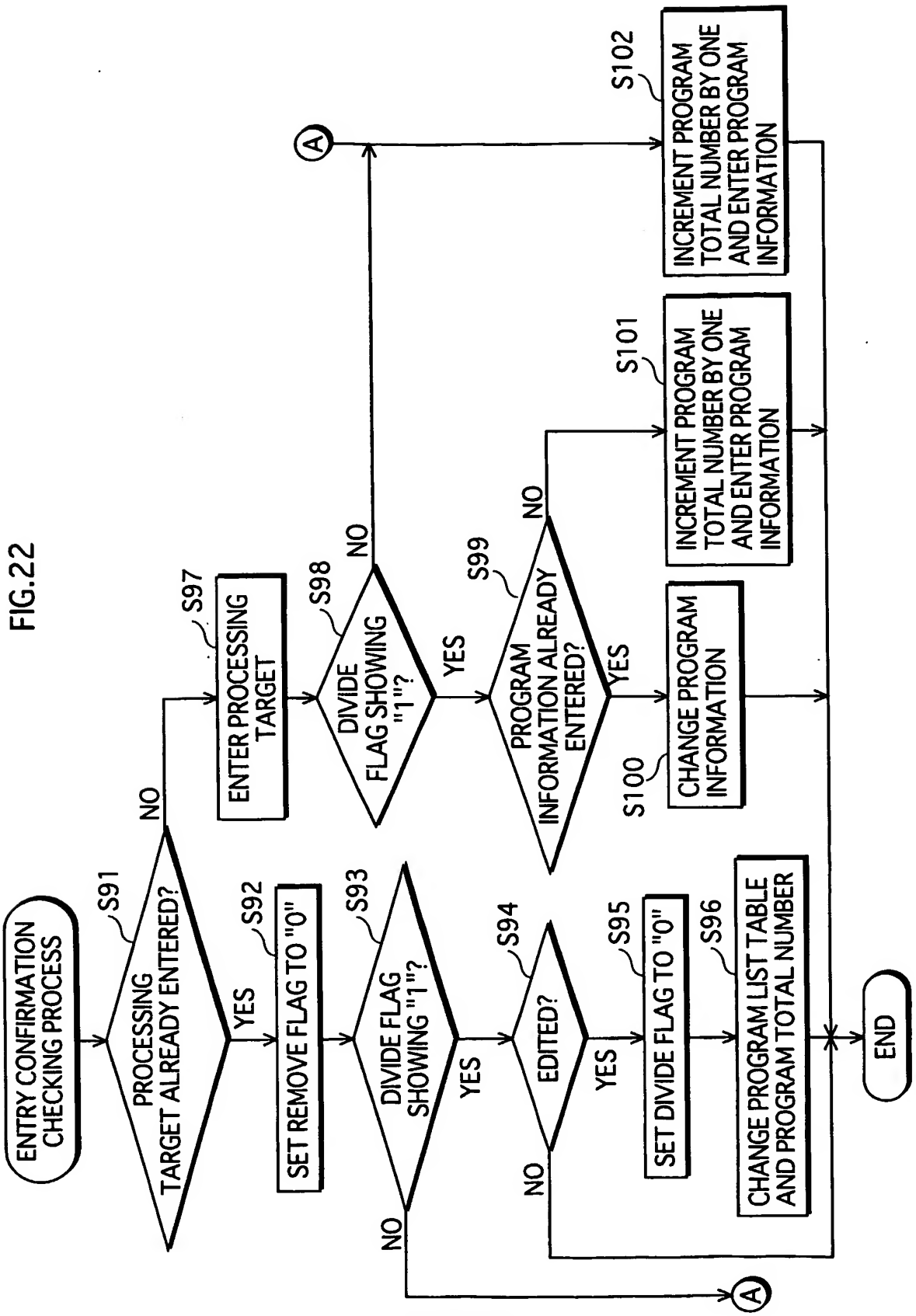

ENTRY CONFIRMATION CHECKING PROCESS
S91
PROCESSING TARGET ALREADY ENTERED?
NO
YES
S92
SET REMOVE FLAG TO "0"
S93
DIVIDE FLAG SHOWING "1"?
NO
YES
S94
EDITED?
NO
YES
S95
SET DIVIDE FLAG TO "0"
S96
CHANGE PROGRAM LIST TABLE AND PROGRAM TOTAL NUMBER
END
A
S97
ENTER PROCESSING TARGET
S98
DIVIDE FLAG SHOWING "1"?
NO
YES
S99
PROGRAM INFORMATION ALREADY ENTERED?
NO
YES
S100
CHANGE PROGRAM INFORMATION
S101
INCREMENT PROGRAM TOTAL NUMBER BY ONE AND ENTER PROGRAM INFORMATION
S102
INCREMENT PROGRAM TOTAL NUMBER BY ONE AND ENTER PROGRAM INFORMATION

FIG.23

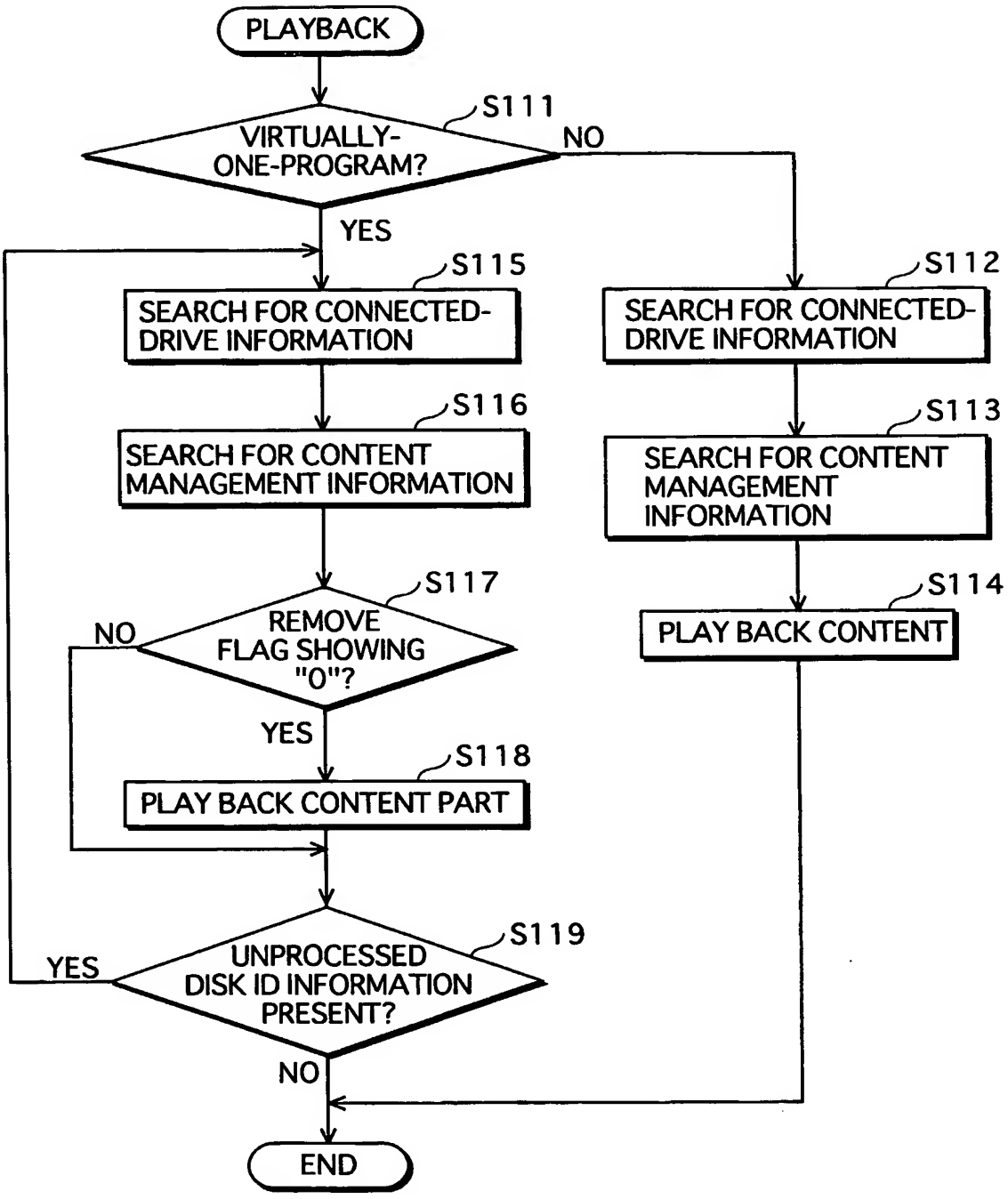

PLAYBACK
S111
VIRTUALLY-ONE-PROGRAM?
NO
YES
S115
SEARCH FOR CONNECTED-DRIVE INFORMATION
S116
SEARCH FOR CONTENT MANAGEMENT INFORMATION
S117
REMOVE FLAG SHOWING "0"?
NO
YES
S118
PLAY BACK CONTENT PART
S119
UNPROCESSED DISK ID INFORMATION PRESENT?
YES
NO
END
S112
SEARCH FOR CONNECTED-DRIVE INFORMATION
S113
SEARCH FOR CONTENT MANAGEMENT INFORMATION
S114
PLAY BACK CONTENT

FIG.24

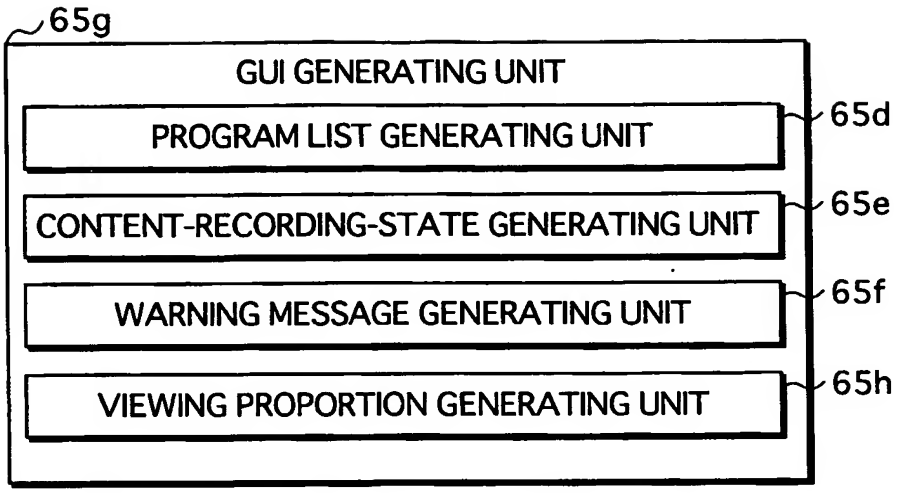

65g
GUI GENERATING UNIT
PROGRAM LIST GENERATING UNIT
65d
CONTENT-RECORDING-STATE GENERATING UNIT
65e
WARNING MESSAGE GENERATING UNIT
65f
VIEWING PROPORTION GENERATING UNIT
65h

FIG.25

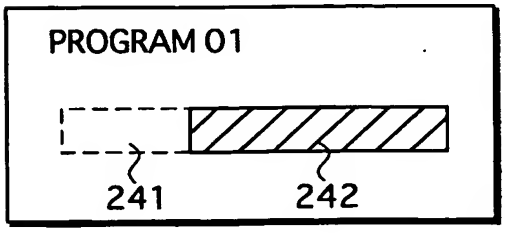
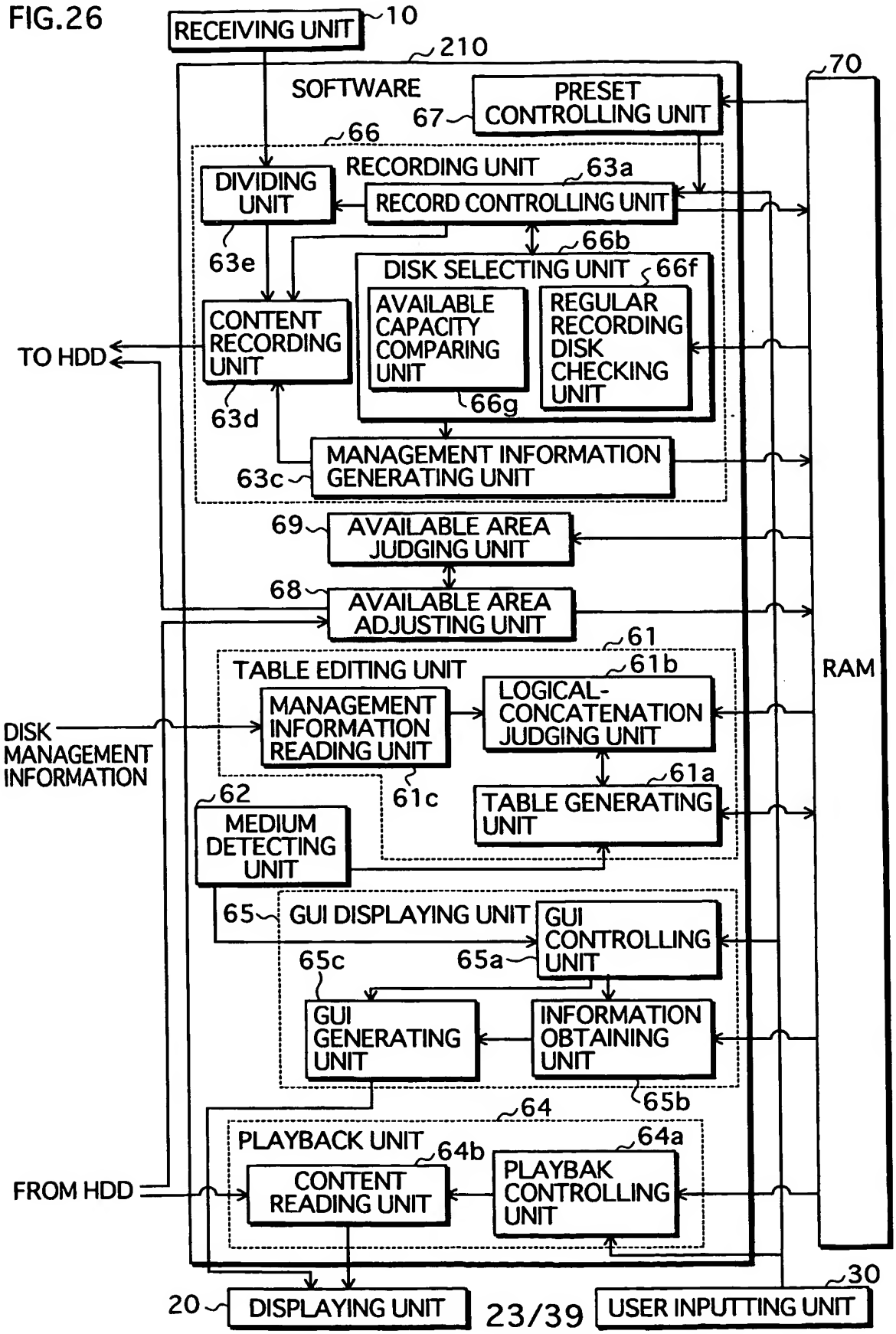

PROGRAM 01
241
242

FIG.26


RECEIVING UNIT
10
210
SOFTWARE
PRESET CONTROLLING UNIT
67
70
66
RECORDING UNIT
63a
DIVIDING UNIT
RECORD CONTROLLING UNIT
66b
63e
DISK SELECTING UNIT
66f
AVAILABLE CAPACITY COMPARING UNIT
REGULAR RECORDING DISK CHECKING UNIT
66g
CONTENT RECORDING UNIT
TO HDD
63d
MANAGEMENT INFORMATION GENERATING UNIT
63c
69
AVAILABLE AREA JUDGING UNIT
68
AVAILABLE AREA ADJUSTING UNIT
61
TABLE EDITING UNIT
61b
MANAGEMENT INFORMATION READING UNIT
LOGICAL-CONCATENATION JUDGING UNIT
RAM
DISK MANAGEMENT INFORMATION
61c
61a
TABLE GENERATING UNIT
62
MEDIUM DETECTING UNIT
65
GUI DISPLAYING UNIT
GUI CONTROLLING UNIT
65c
65a
GUI GENERATING UNIT
INFORMATION OBTAINING UNIT
65b
64
PLAYBACK UNIT
64b
64a
CONTENT READING UNIT
PLAYBAK CONTROLLING UNIT
FROM HDD
30
20
DISPLAYING UNIT
USER INPUTTING UNIT

10/533552

FIG.27

FIG.28

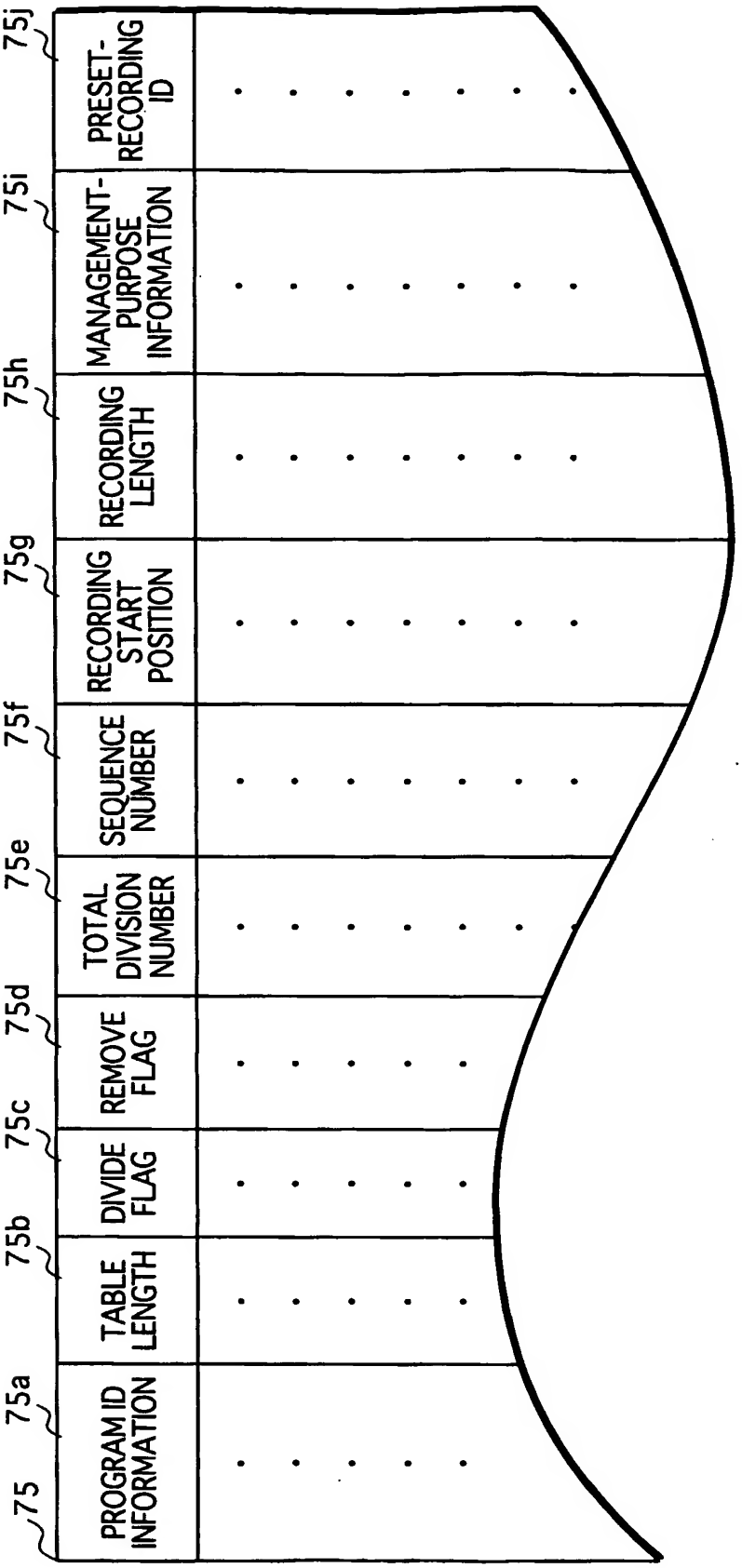

75
PROGRAM ID INFORMATION
75a
TABLE LENGTH
75b
DIVIDE FLAG
75c
REMOVE FLAG
75d
TOTAL DIVISION NUMBER
75e
SEQUENCE NUMBER
75f
RECORDING START POSITION
75g
RECORDING LENGTH
75h
MANAGEMENT-PURPOSE INFORMATION
75i
PRESET-RECORDING ID
75j

FIG.29

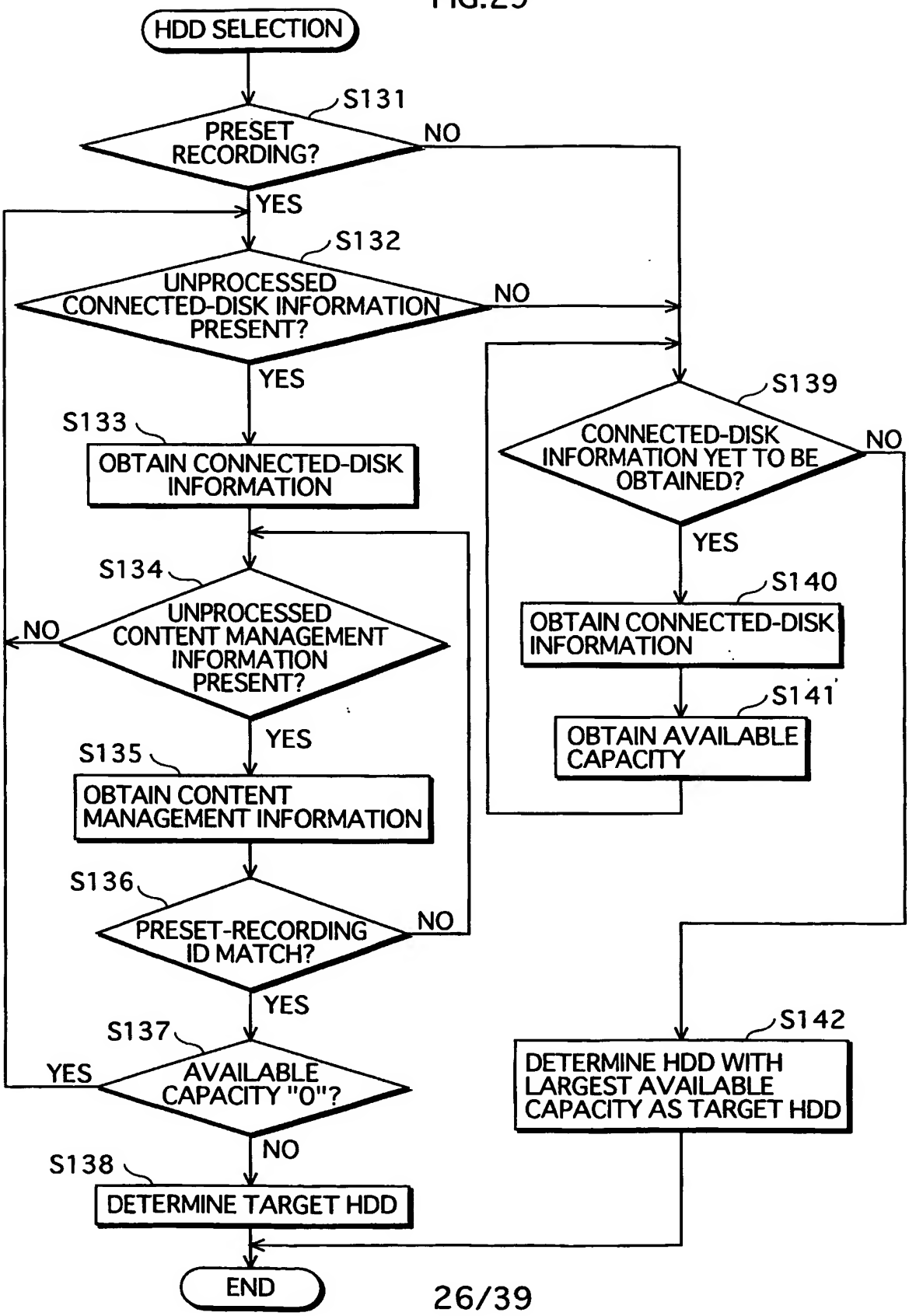

HDD SELECTION
S131
PRESET RECORDING?
NO
YES
S132
UNPROCESSED CONNECTED-DISK INFORMATION PRESENT?
NO
YES
S133
OBTAIN CONNECTED-DISK INFORMATION
S134
UNPROCESSED CONTENT MANAGEMENT INFORMATION PRESENT?
NO
YES
S135
OBTAIN CONTENT MANAGEMENT INFORMATION
S136
PRESET-RECORDING ID MATCH?
NO
YES
S137
AVAILABLE CAPACITY "0"?
YES
NO
S138
DETERMINE TARGET HDD
S139
CONNECTED-DISK INFORMATION YET TO BE OBTAINED?
NO
YES
S140
OBTAIN CONNECTED-DISK INFORMATION
S141
OBTAIN AVAILABLE CAPACITY
S142
DETERMINE HDD WITH LARGEST AVAILABLE CAPACITY AS TARGET HDD
END

FIG.30

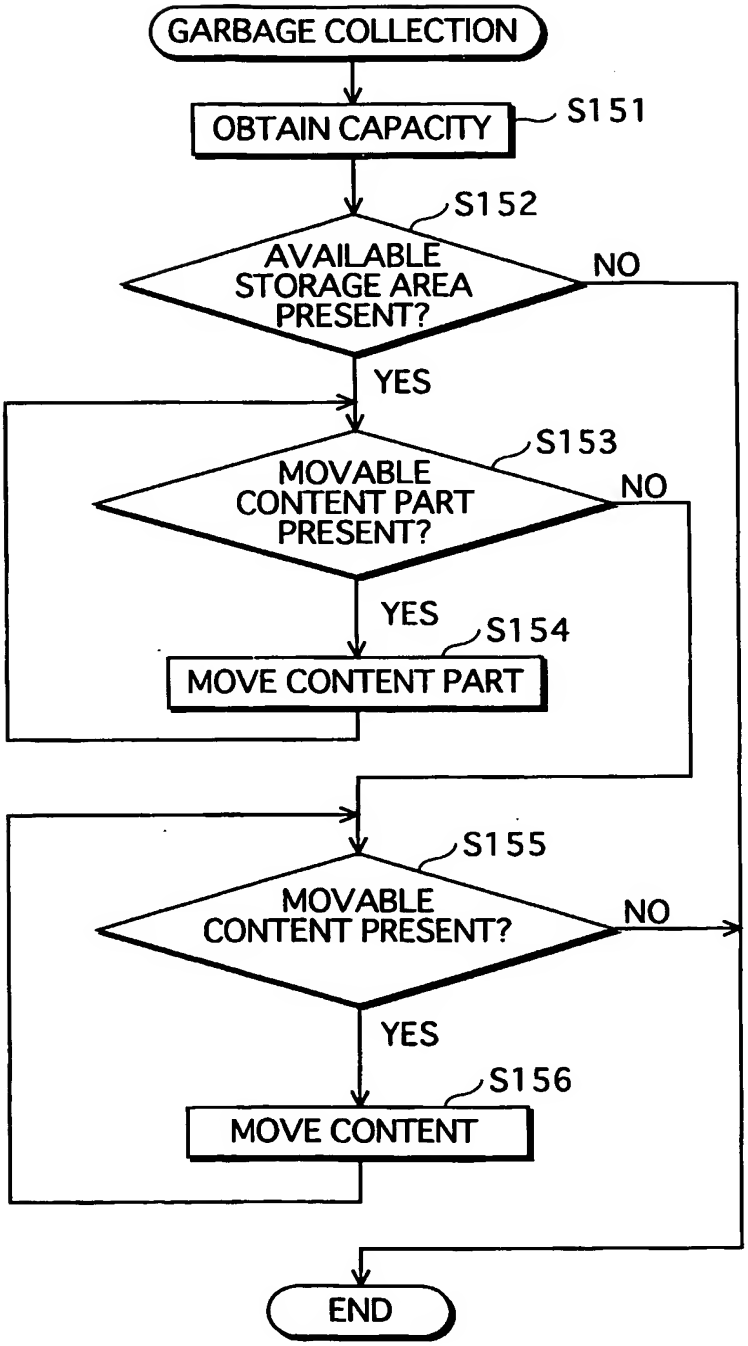

GARBAGE COLLECTION
OBTAIN CAPACITY
S151
S152
AVAILABLE STORAGE AREA PRESENT?
NO
YES
S153
MOVABLE CONTENT PART PRESENT?
NO
YES
S154
MOVE CONTENT PART
S155
MOVABLE CONTENT PRESENT?
NO
YES
S156
MOVE CONTENT
END

FIG.31

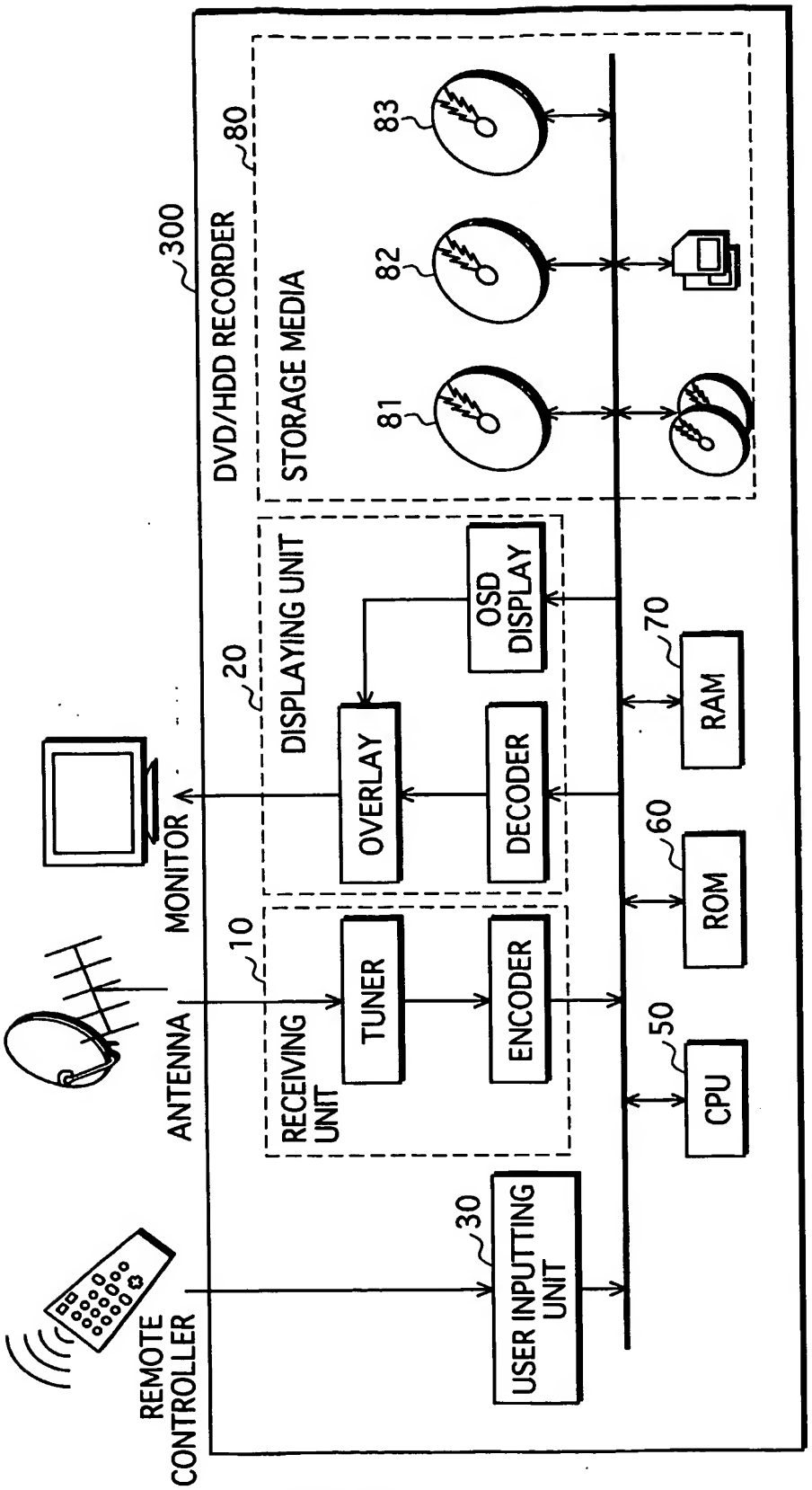

300
DVD/HDD RECORDER
80
STORAGE MEDIA
83
82
81
20
DISPLAYING UNIT
OSD DISPLAY
OVERLAY
DECODER
70
RAM
MONITOR
60
ROM
10
RECEIVING UNIT
TUNER
ENCODER
ANTENNA
50
CPU
30
USER INPUTTING UNIT
REMOTE CONTROLLER

FIG.32

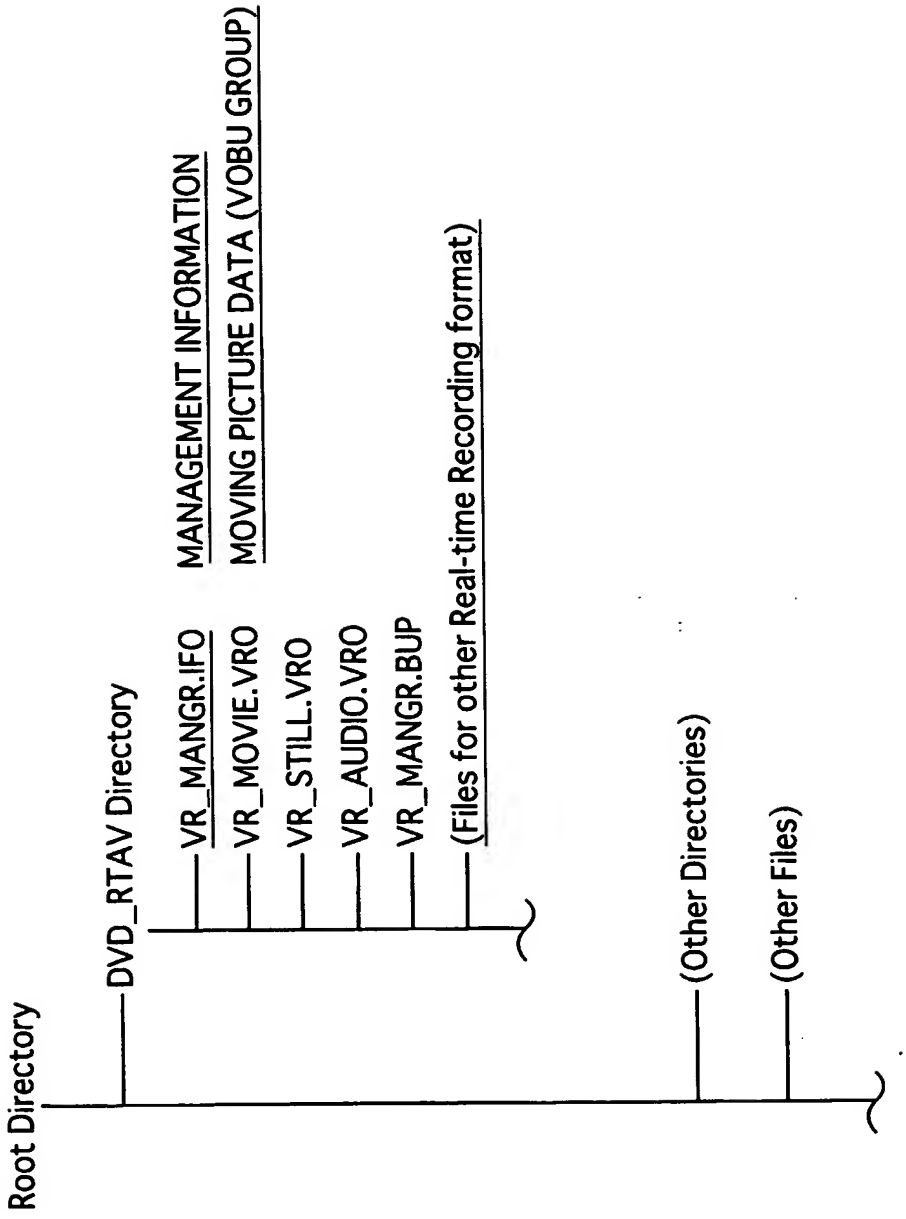

Root Directory
DVD_RTAV Directory
VR_MANGR.IFO
MANAGEMENT INFORMATION
VR_MOVIE.VRO
MOVING PICTURE DATA (VOBU GROUP)
VR_STILL.VRO
VR_AUDIO.VRO
VR_MANGR.BUP
(Files for other Real-time Recording format)
(Other Directories)
(Other Files)

FIG.33

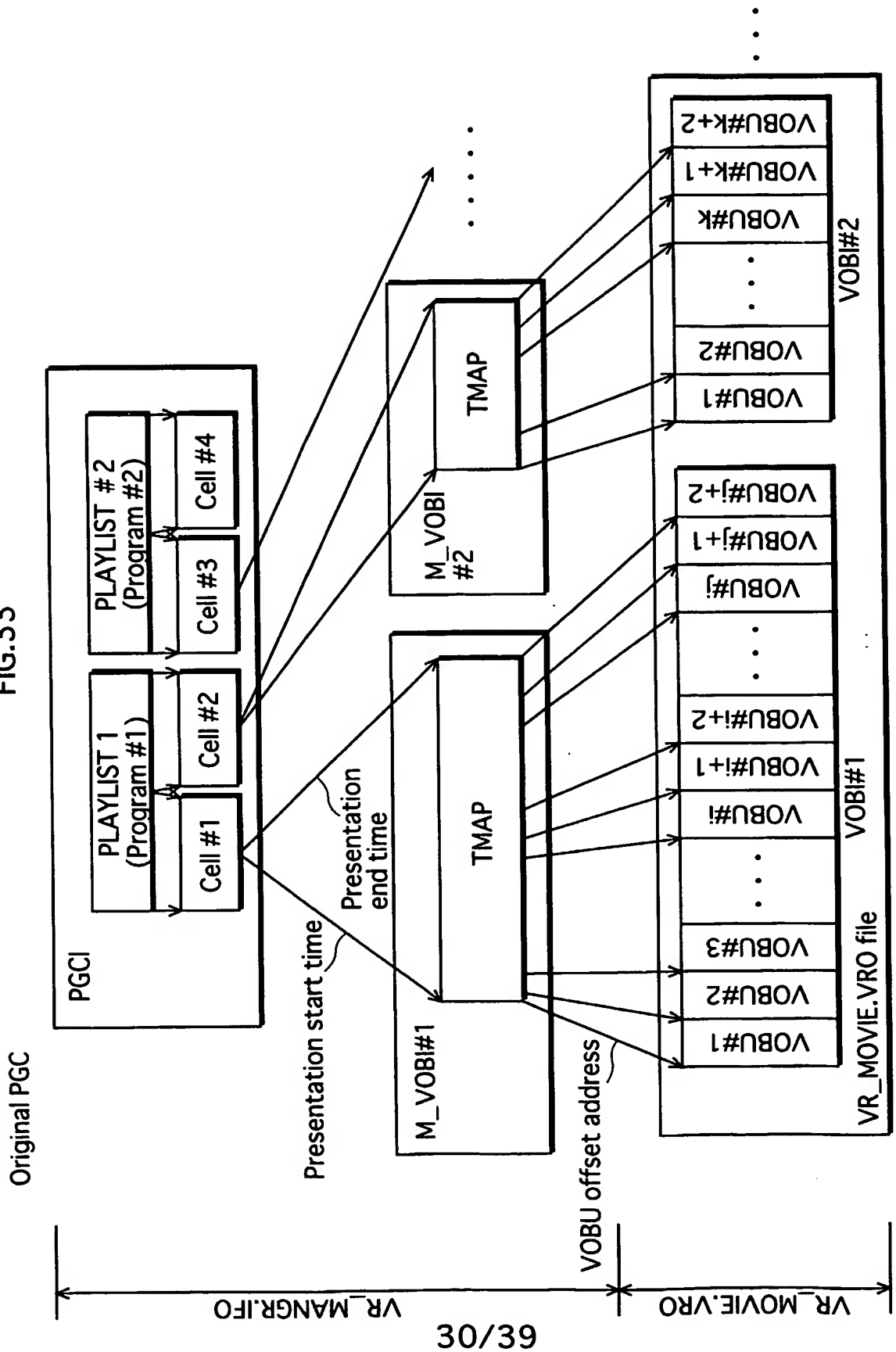
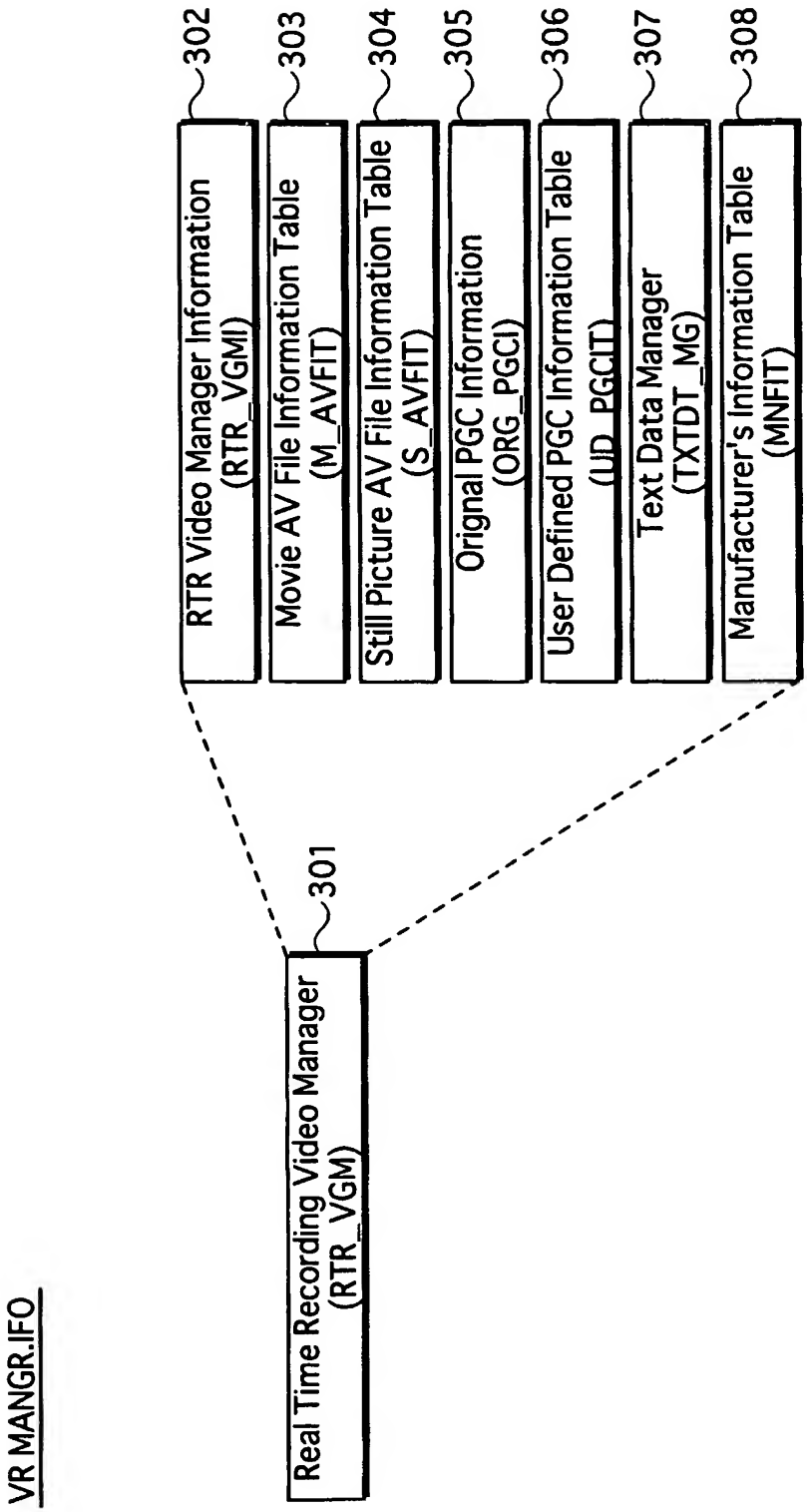

Original PGC
PGCI
PLAYLIST 1 (Program #1)
PLAYLIST # 2 (Program #2)
Cell #1
Cell #2
Cell #3
Cell #4
Presentation start time
Presentation end time
M_VOBI#1
M_VOBI #2
TMAP
TMAP
VOBU offset address
VR_MOVIE.VRO file
VOBI#1
VOBI#2
VOBU#1
VOBU#2
VOBU#3
VOBU#i
VOBU#i+1
VOBU#i+2
VOBU#j
VOBU#j+1
VOBU#j+2
VOBU#k
VOBU#k+1
VOBU#k+2
VR_MANGR.IFO
VR_MOVIE.VRO

FIG.34


VR MANGR.IFO
Real Time Recording Video Manager (RTR_VGM)
301
RTR Video Manager Information (RTR_VGMI)
302
Movie AV File Information Table (M_AVFIT)
303
Still Picture AV File Information Table (S_AVFIT)
304
Orignal PGC Information (ORG_PGCI)
305
User Defined PGC Information Table (UD_PGCIT)
306
Text Data Manager (TXTDT_MG)
307
Manufacturer's Information Table (MNFIT)
308

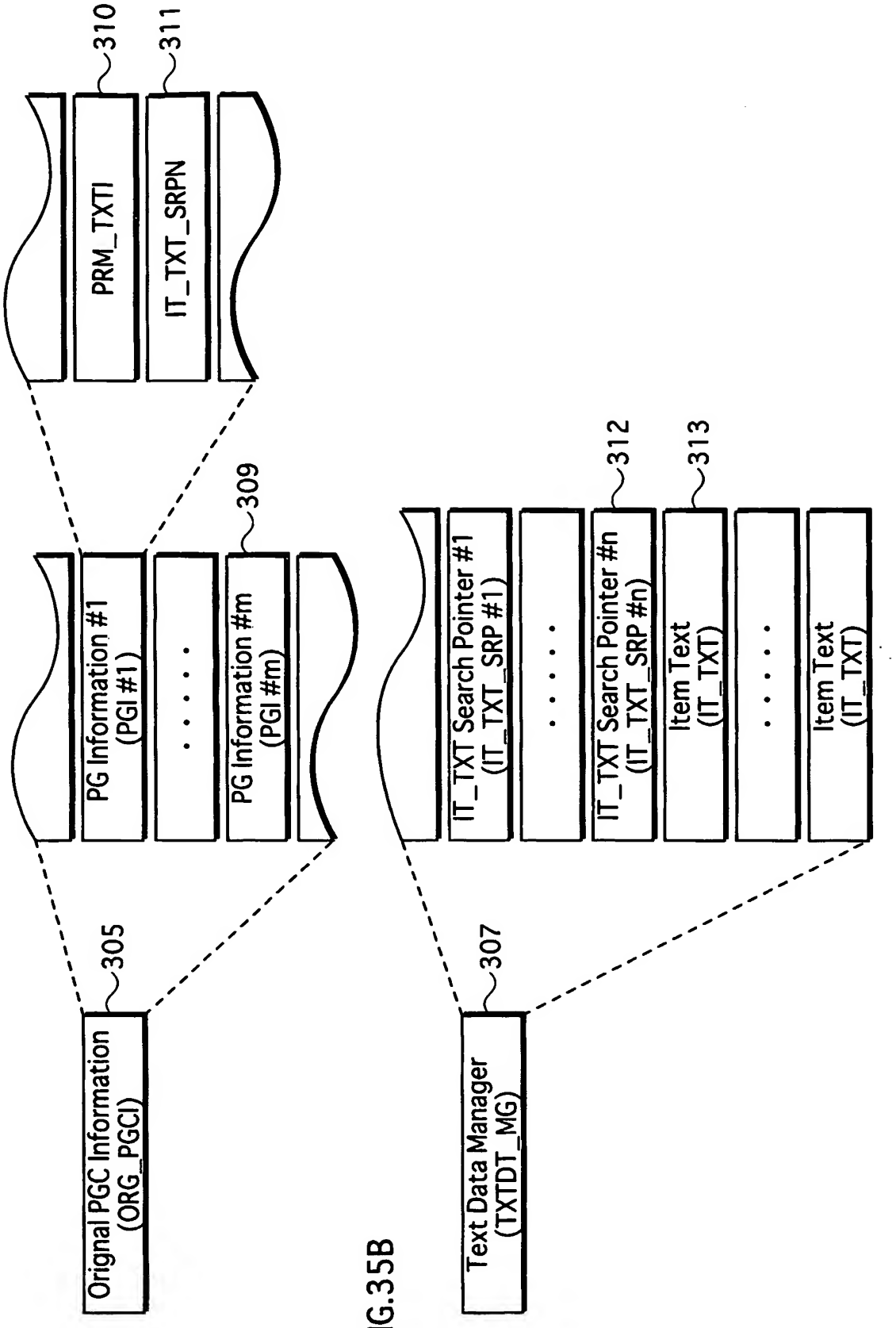
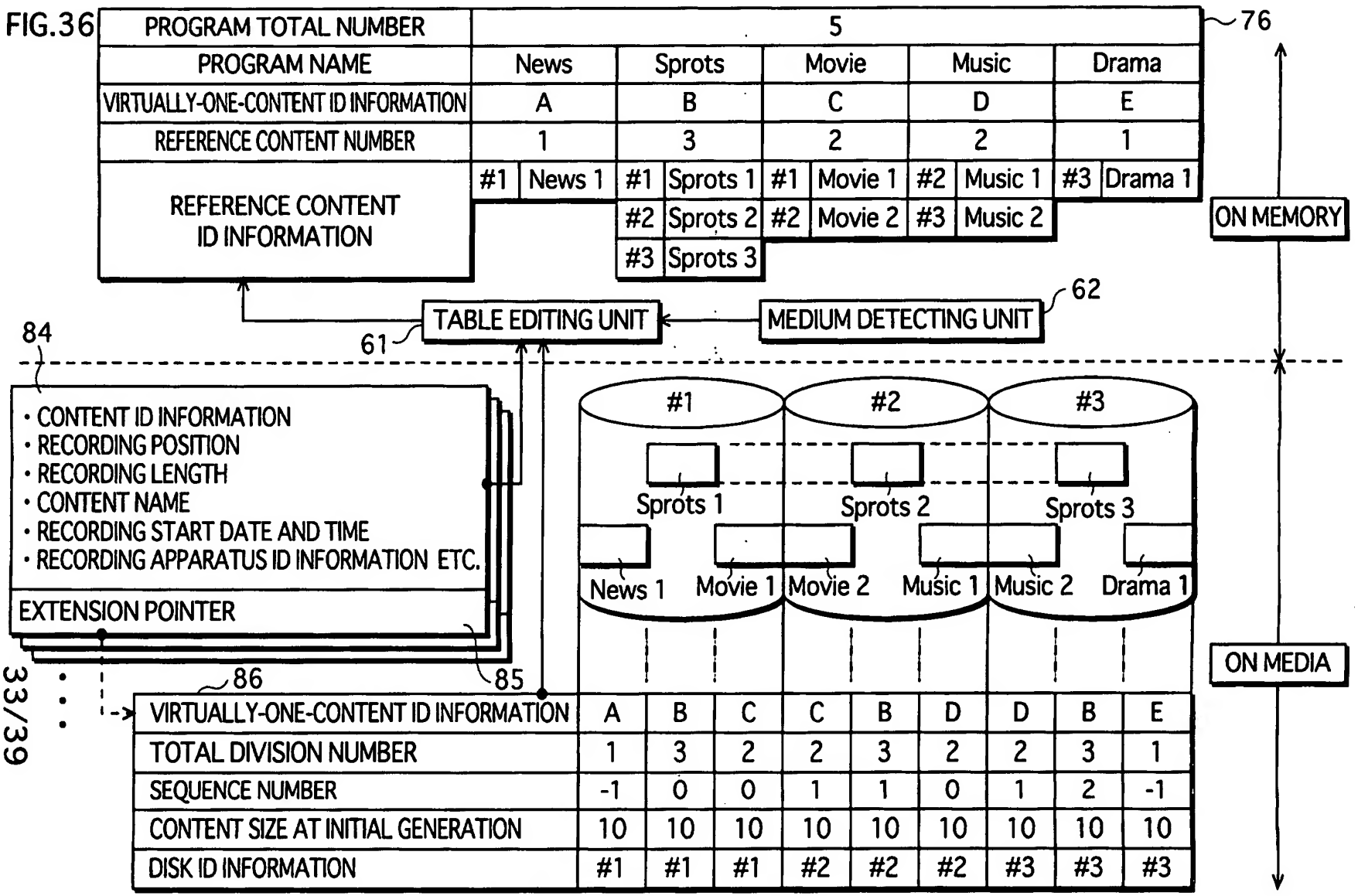



FIG.35A

FIG.35B

FIG.36






WO 2004/049151
PCT/JP2003/015056
10/533552

10/533552

FIG.37

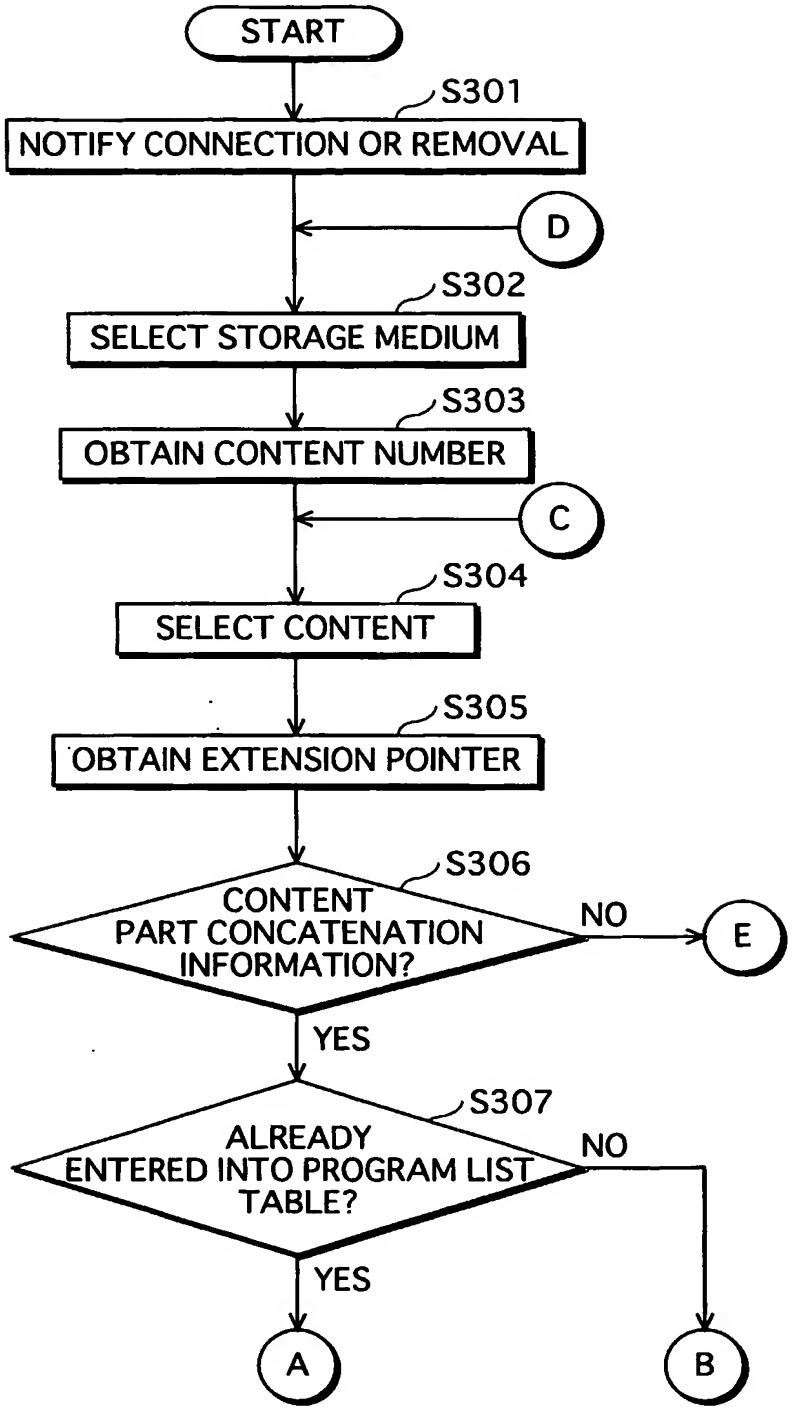
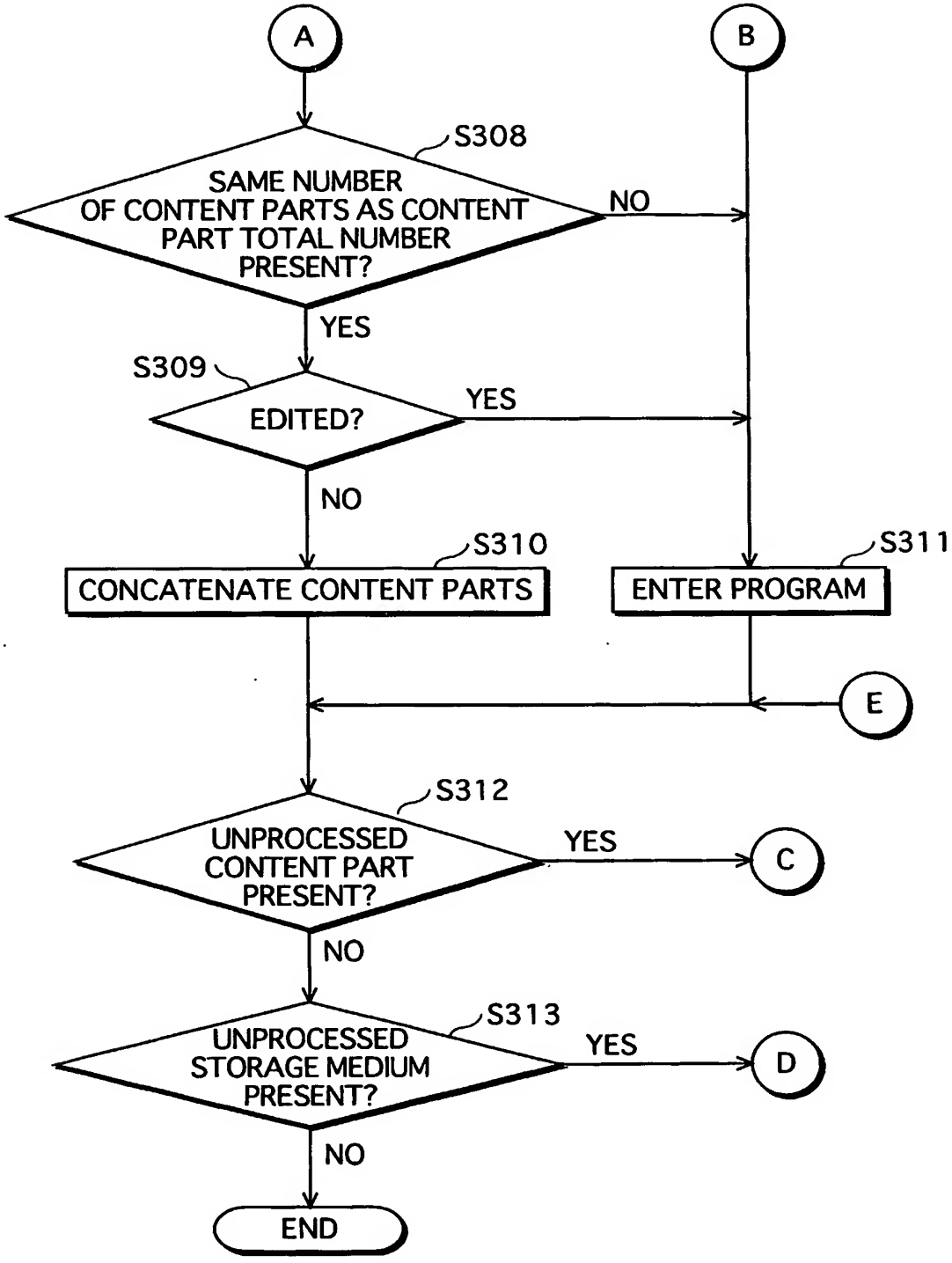


FIG.38


A
B
S308
SAME NUMBER OF CONTENT PARTS AS CONTENT PART TOTAL NUMBER PRESENT?
NO
YES
S309
EDITED?
YES
NO
S310
CONCATENATE CONTENT PARTS
S311
ENTER PROGRAM
E
S312
UNPROCESSED CONTENT PART PRESENT?
YES
C
NO
S313
UNPROCESSED STORAGE MEDIUM PRESENT?
YES
D
NO
END

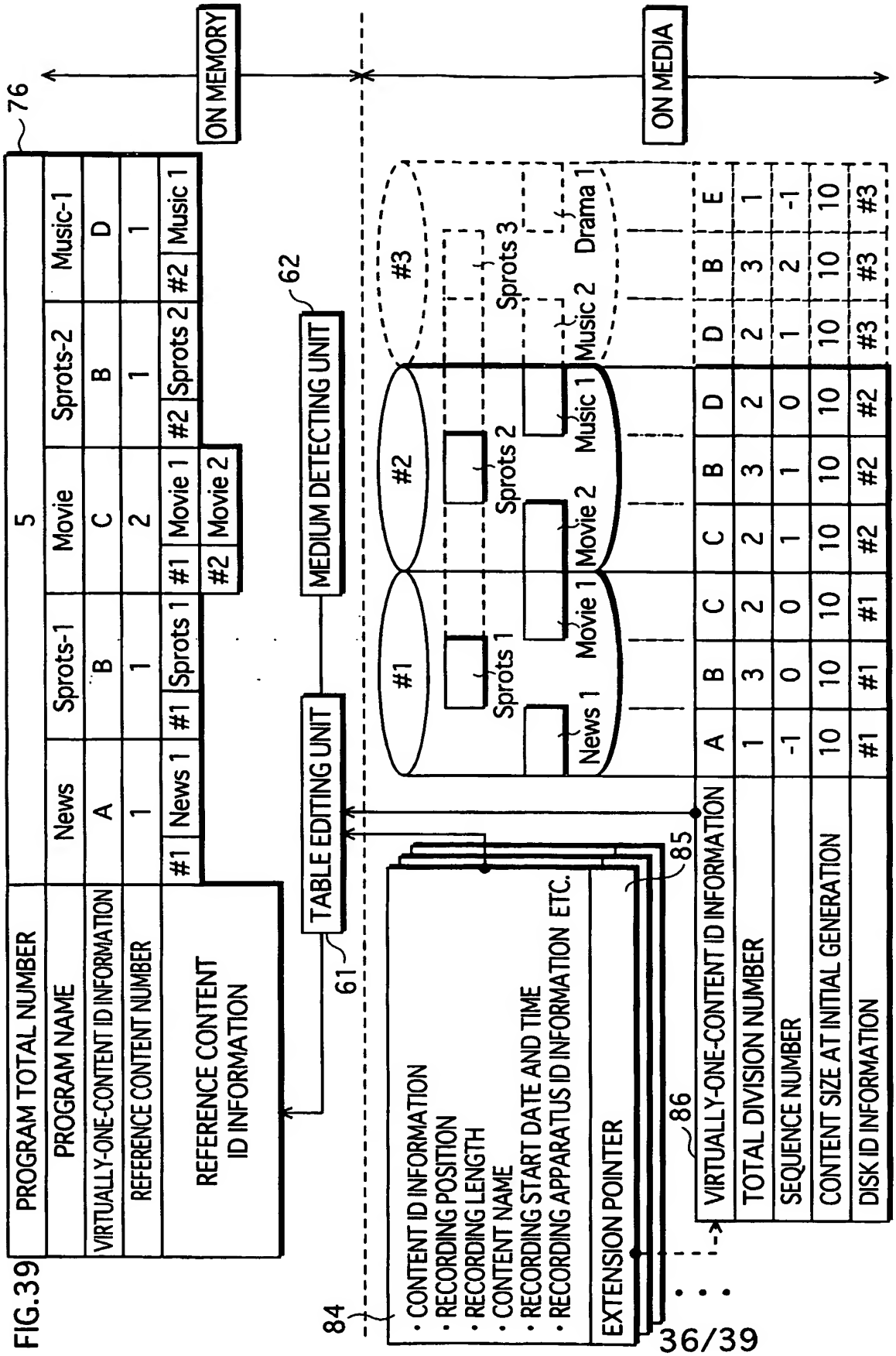

ON MEMORY
ON MEDIA
76
5
PROGRAM TOTAL NUMBER
PROGRAM NAME
VIRTUALLY-ONE-CONTENT ID INFORMATION
REFERENCE CONTENT NUMBER
REFERENCE CONTENT ID INFORMATION
News
Sprots-1
Movie
Sprots-2
Music-1
A
B
C
D
1
2
#1
#2
News 1
Sprots 1
Movie 1
Movie 2
Sprots 2
Music 1
62
MEDIUM DETECTING UNIT
TABLE EDITING UNIT
61
84
85
86
• CONTENT ID INFORMATION
• RECORDING POSITION
• RECORDING LENGTH
• CONTENT NAME
• RECORDING START DATE AND TIME
• RECORDING APPARATUS ID INFORMATION ETC.
EXTENSION POINTER
#3
Sprots 3
Music 2
Drama 1
E
VIRTUALLY-ONE-CONTENT ID INFORMATION
TOTAL DIVISION NUMBER
SEQUENCE NUMBER
CONTENT SIZE AT INITIAL GENERATION
DISK ID INFORMATION

FIG.39

FIG.40

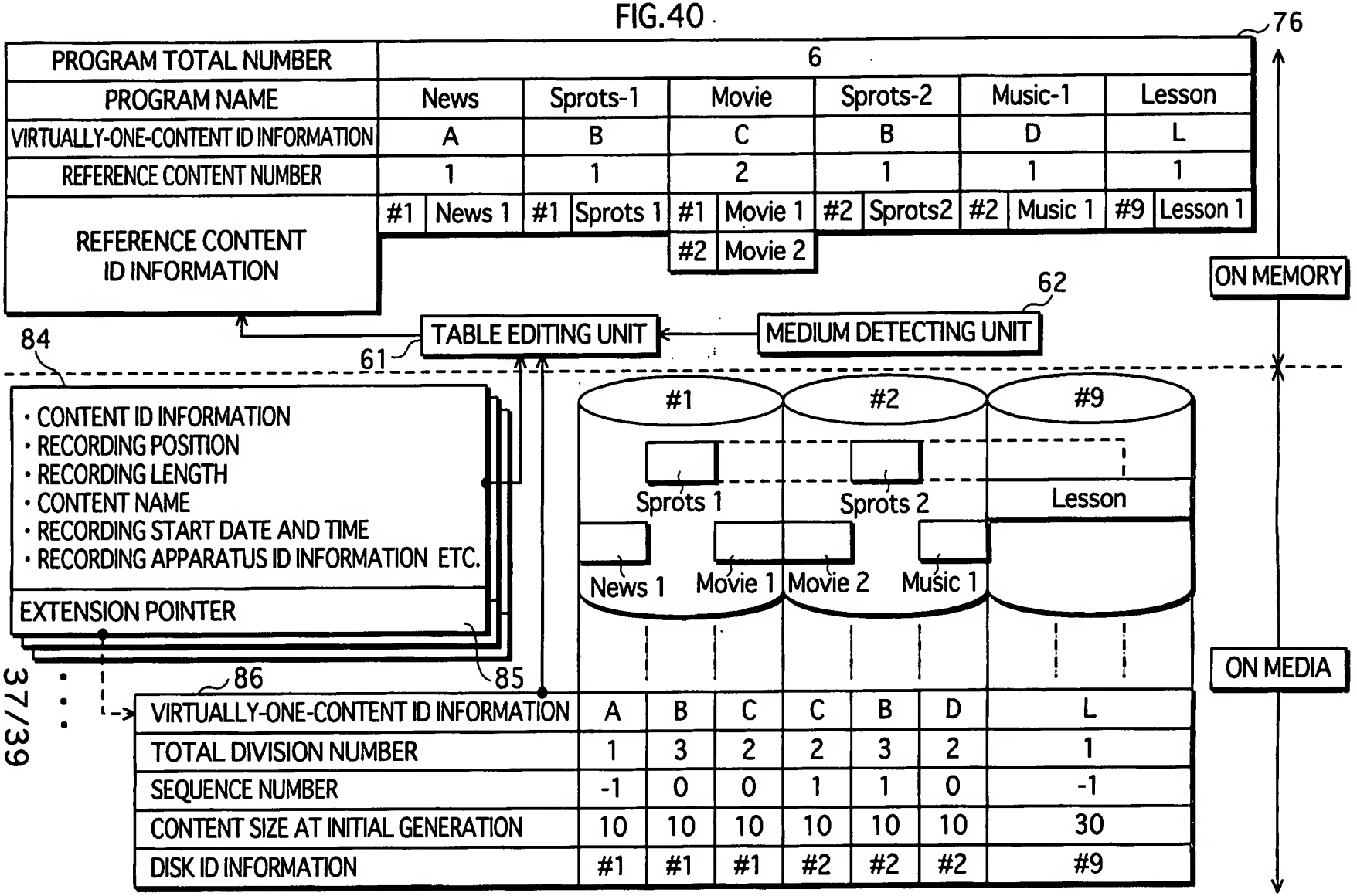
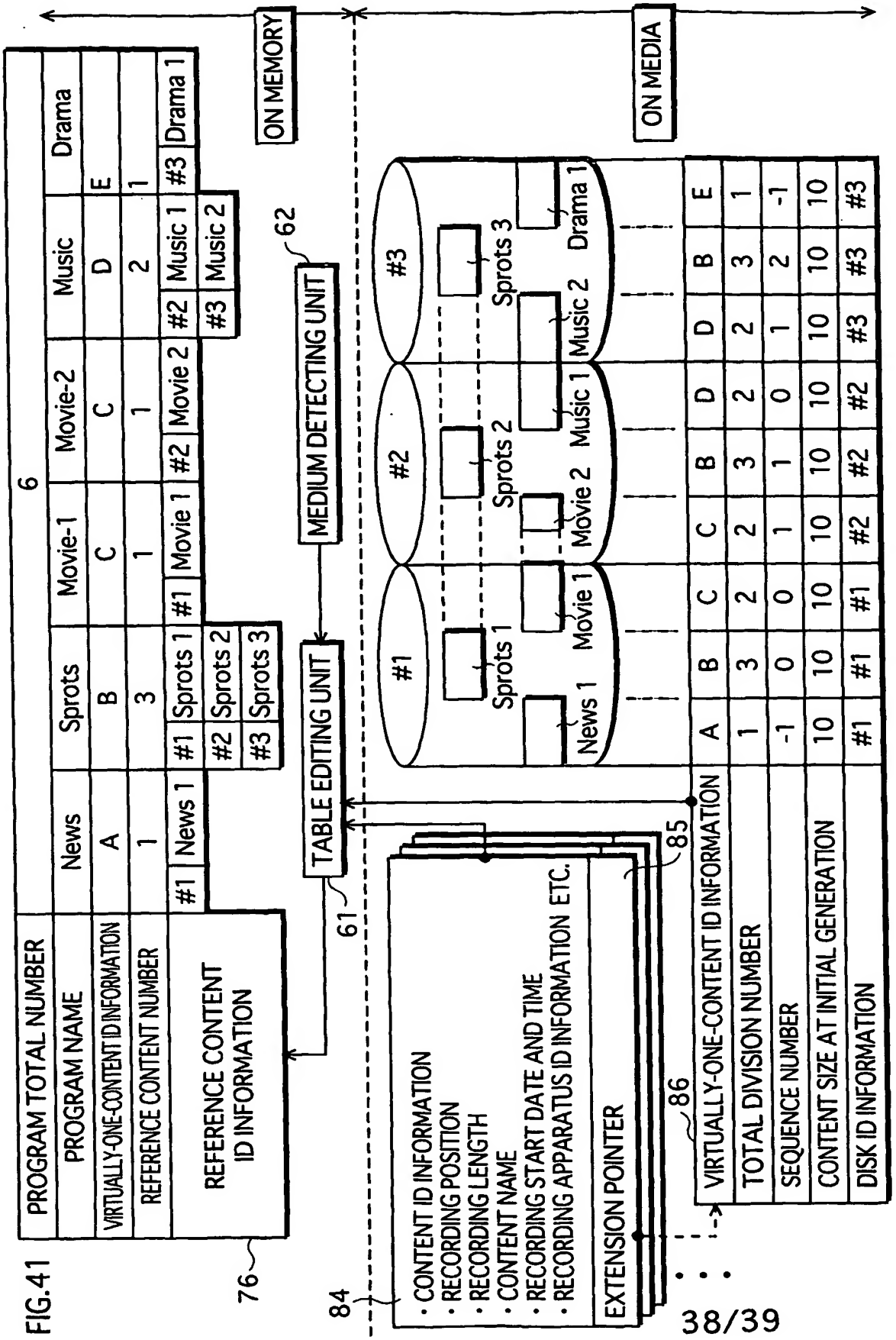

76
PROGRAM TOTAL NUMBER
6
PROGRAM NAME
News
Sprots-1
Movie
Sprots-2
Music-1
Lesson
VIRTUALLY-ONE-CONTENT ID INFORMATION
A
B
C
B
D
L
REFERENCE CONTENT NUMBER
1
1
2
1
1
1
REFERENCE CONTENT ID INFORMATION
#1 News 1
#1 Sprots 1
#1 Movie 1
#2 Movie 2
#2 Sprots2
#2 Music 1
#9 Lesson 1
ON MEMORY
62
TABLE EDITING UNIT
MEDIUM DETECTING UNIT
84
61
• CONTENT ID INFORMATION
• RECORDING POSITION
• RECORDING LENGTH
• CONTENT NAME
• RECORDING START DATE AND TIME
• RECORDING APPARATUS ID INFORMATION ETC.
EXTENSION POINTER
#1
#2
#9
Sprots 1
Sprots 2
Lesson
News 1
Movie 1
Movie 2
Music 1
ON MEDIA
37/39
86
85
VIRTUALLY-ONE-CONTENT ID INFORMATION
A
B
C
C
B
D
L
TOTAL DIVISION NUMBER
1
3
2
2
3
2
1
SEQUENCE NUMBER
-1
0
0
1
1
0
-1
CONTENT SIZE AT INITIAL GENERATION
10
10
10
10
10
10
30
DISK ID INFORMATION
#1
#1
#1
#2
#2
#2
#9

FIG.41


6
PROGRAM TOTAL NUMBER
PROGRAM NAME
VIRTUALLY-ONE-CONTENT ID INFORMATION
REFERENCE CONTENT NUMBER
REFERENCE CONTENT ID INFORMATION
News
Sprots
Movie-1
Movie-2
Music
Drama
A
B
C
C
D
E
1
3
1
1
2
1
#1 News 1
#1 Sprots 1
#2 Sprots 2
#3 Sprots 3
#1 Movie 1
#2 Movie 2
#2 Music 1
#3 Music 2
#3 Drama 1
ON MEMORY
ON MEDIA
MEDIUM DETECTING UNIT
62
TABLE EDITING UNIT
61
76
84
85
86
• CONTENT ID INFORMATION
• RECORDING POSITION
• RECORDING LENGTH
• CONTENT NAME
• RECORDING START DATE AND TIME
• RECORDING APPARATUS ID INFORMATION ETC.
EXTENSION POINTER
#1
#2
#3
Sprots 1
Sprots 2
Sprots 3
News 1
Movie 1
Movie 2
Music 1
Music 2
Drama 1
VIRTUALLY-ONE-CONTENT ID INFORMATION
TOTAL DIVISION NUMBER
SEQUENCE NUMBER
CONTENT SIZE AT INITIAL GENERATION
DISK ID INFORMATION
A
B
C
C
D
E
1
3
2
2
2
1
-1
0
0
1
1
0
1
2
-1
10
10
10
10
10
10
#1
#1
#1
#2
#2
#2
#3
#3
#3

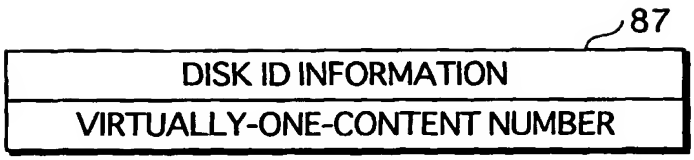



FIG.42